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Draft Report

Phase 2, Stage 2A General Overview Analysis

Environmental Assessment of the Landfill Component of Halton's Solid Waste Management System

34v

DRAFT REPORT

GENERAL OVERVIEW ANALYSIS
PHASE 2, STAGE 2A

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SECTION 1 - BACKGROUND AND PURPOSE

1.1 Background

This report has been prepared in accordance with the Final Work Program, May 1983, and comprises the first step in the site selection process for the landfill component of Halton's solid waste management system.

The initial part of Phase 2 included Stage 1 - Waste Needs and Systems Analysis, which evaluated a series of generic waste disposals systems for Halton Region. The generic systems reviewed in Stage 1 were as follows:

System 1 Mass Burning with Energy Recovery
System 2 Materials Processing - Resource Recovery Plant
System 3 Export to Occidental Chemical Ltd., Niagara Falls N.Y.
System 4 Sanitary Landfill

All of the above systems included a source separation component, and a contingency landfill volume for possible disposal of wastes not currently accepted at Halton's landfill site(s).

Various levels of total landfill space required were calculated, based on the characteristics of each system, and the contingency factors described above. The range of landfill volume required for the 20 year planning period from 1983-2001 was 5.7 million cubic yards to 13.7 million cubic yards.

The potential solid waste systems were reviewed in Stage 1, Phase 2, by the public, private and public agencies interest groups. Submissions were received from these groups and reviewed by the Enviromental Assessment study team. The results of the Stage 1 review are included in the report, "Stage 1: Waste Needs and Systems Analysis Consolidation", May 1983. In June, 1983, a decision was reached by Regional Council to proceed with a resource recovery based solid waste management system with a landfill component of a maximum of 7.2 million cubic yards.[1] No decision regarding a single site or multi-site

[1]The volume of landfill space required is subject to review by Regional Council before completion of each stage of the site selection process.

approach has been taken to date and therefore, the number of site(s) required and the size of such site or sites will not be included as a factor in the selection of candidate areas in this draft report.

1.2 Purpose

The purpose of the General Overview Analysis is to identify areas within the entire Region that would be suitable for the operation of a sanitary landfill site(s). Three major steps were undertaken in order to achieve the above stated purpose, as follows:

- Development of draft and final evaluation factors to screen areas for landfill;
- Preparation of overlay mapping to identify "unacceptable", "high", "moderate" and "low" levels of impact;
- Identification of candidate areas based on screening and prioritizing the evaluation factors.

These steps and methodolgy for the General Overview Analysis are described in detail throughout the draft report. The conclusions of the study team's findings on the General Overview Analysis are reflected in the final section of the draft report which identifies potential candidate areas for further investigation.

The study team invites comments from the public, private and public agencies, particulary special interest groups, that may be affected in the vicinity of the candidate areas. It should be stressed that the candidate areas have been publicly released for review and comment. There is a Public Open House scheduled on September 20, 1983 at the Regional Administration Building from 5:00 p.m. to 10:00 p.m. Input from groups and individuals on the site selection process and findings to date would be appreciated as it is an essential component of the study process.

SECTION 2 - EVALUATION FACTORS FOR THE GENERAL OVERVIEW ANALYSIS

2.1 Introduction

This section describes the site selection process used in the General Overview Analysis and the final evaluation factors for the landfill component. It should be emphasized that the evaluation factors were primarily intended to screen out areas of the Region that would not be suitable for further consideration for landfilling. This is the first step in the site selection process and, therefore, the evaluation factors are relatively broad in scope and are not related to site-specific issues, such as design and operating costs of landfills, community profiles or characteristics, or site-specific characteristics of environmentally sensitive areas. These types of issues will be dealt with at the site comparison stage of Phase 2.

A Draft Evaluation Factors Report, Phase 2, Stage 2A: General Overview Analysis, July, 1983, was circulated to the study's mailing list in July 1983. Submissions were received from the following agencies and interest groups:

- Regional Municipality of Halton, Planning & Development Department (R. Mohammed)
- Regional Municipality of Halton: Public Works Department (G.N. Woodburn)
- Regional Municipality of Halton: Ecological and Environmental Advisory Committee (E.E.A.C.)
- Ministry of the Environment: Environmental Assessment Branch (P. Rennick)
- Ministry of the Environment: Environmental Approvals and Project Engineering Branch (P.S. Isles)
- The Niagara Escarpment Commission (C.A. Louis)
- The Tremaine-Britannia Citizens Group (A. Katz)

The submissions were analyzed in detail by the study team, and amendments to the evaluation factors were incorporated into the Final Evaluation Factors Report, August 1983.

A Public Information Centre was held on July 20, 1983, during which public input on the Draft Evaluation Factors Report was invited. A report summarizing the results of the Public Information Centre is included in Appendix 1.

2.2 Site Screening Process

The process of identifying and evaluating potential areas for landfilling is being undertaken in three major steps, as identified in the Final Work Program for the Environmental Assessment, May, 1983.

The site selection stage is referred to generally as Stage 2 and the 3 steps within Stage 2 are referred to as sub-stages. The following sequence of sub-stages will occur in the screening process:

Stage 2A: General Overview Analysis
Stage 2B: Detailed Site Comparison
Stage 2C: Final Site(s) Evaluation

The purpose of this section is to describe the screening process for the General Overview Analysis and to establish the evaluation factors to be used in the screening process for the General Overview Analysis. It should be noted that the specific process for site selection discussed in this section applies to the first screening level, which is the overview of the entire Region of Halton. Similarly, the final evaluation factors apply to the first step in the site selection process. More detailed evaluation factors will be established at each subsequent step leading up to the final selection of a landfill site or sites. The evaluation factors may be generally categorized as follows:

A. Physical Factors

- Soils/Geology
- Topography and Landforms
- Hydrology
- Hydrogeology
- Biophysical
- Land Use (including agriculture, recreation and other resource lands)
- Transportation

B. Social Factors

- Population Density
- Community Services (including recreation) and Institutions

C. Economic

- Haul Costs
- Land Costs

D. Cultural

- Historical
- Archaeological

In accordance with the Final Work Program, May 1983, the following activities were undertaken in the General Overview Analysis:

. identify physical, social, economic and cultural factors to be used in review of potential landfill areas in Halton;

. identify acceptable levels of impact for each of the factors identified;

. establish what level of analysis would be appropriate to an initial screening of lands in Halton Region;

. circulate evaluation factors and revise, as necessary; and

. undertake screening process and identify potential areas for landfilling.

It should be noted that this stage is based on common elements for the selection of potential landfilling areas, which do not change regardless of the preferred waste management system. In other words, the overview stage was intended to screen out areas that would be unsuitable for landfilling from a physical, economic, social and cultural standpoint.

Our assumption of the landfill component required at this stage is based on Regional Council's approval on June 22, 1983, of a maximum of 7.2 million cubic yards for landfill. It is also assumed that the volume of the landfill component may be reviewed by Council at each subsequent stage in the site selection process until completion of Phase 2, Stage 2 - Site Selection, and that the 7.2 million cubic yards figure may increase if it appears, after investigation, that an EFW facility in Halton cannot accommodate the full volume assigned to it in the generic review of the Waste Needs and Systems Analysis.

The following amendment was approved by Council on June 22, 1983, with respect to the size of the landfill component (volume) required:

> "That item 2.6 of the Planning and Public Works Committee Meeting No. 20-83 be amended to add the following:
>
> 'PROVIDED THAT before completion of each stage of the Site Selection Procedure and again prior to the preparation of the Draft Environmental assessment document in Phase III, the Consultants and the Staff must review with Council the affects on the process of the size of the Landfill Component then being sought.'"

2.3 Basis Of Evaluation Factors

The basis for the evaluation factors used in the General Overview Analysis is described in the work program for Stage 2 (Final Work Program, May 1983, Addendum 6).

The factors are intended to try to cover the broad definition of "environment" in the Environmental Assessment Act, as follows:

> **"(c) 'environment' means,**
>
> **(i) air, land or water,**
>
> **(ii) plant and animal life, including man,**

(iii) the social, economic and cultural conditions that influence the life of man or a community,

(iv) any building, structure, machine or other device or thing made by man,

(v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man, or

(vi) any part or combination of the foregoing and the inter-relationships between any two or more of them,

in or of Ontario".

While these elements of the environment are to be considered in the overall site screening process, we will try to deal with the elements of the environment at an appropriate level of detail for each step in the site screening process. At the first stage - General Overview Analysis, it is important to establish the following:

- approach to screen out areas in Halton Region that would be considered less desirable for landfilling;
- method for identifying areas of Halton Region that would be suitable for landfilling;
- consideration of environmental factors that, when applied in Halton, lead to candidate areas for landfilling;
- system of prioritizing the relative importance of environmental factors at the overview stage.

Each of the above points is dealt with as follows:

a) Suitable Areas for Landfilling

Due to the complexity and diversity of natural environmental conditions in Halton, such as major aquifers, significant ecological habitats, and prominant landforms, the potential impact on these natural environmental conditions could be substantial. Therefore, we propose to give the highest priority at

this stage to avoiding such areas within the Region that could be adversely affected by landfilling activities. In order to fulfill the objective of avoiding areas that could be adversely affected by landfilling, certain factors will be given an "unacceptable" ranking which would mean that areas with specific physical, social or cultural characteristics would be identified as unacceptable and not given further consideration for landfilling at the overview stage.

The system of prioritizing implies some additional weight on physical factors in the initial stage of the site selection process, but the significance of physical factors will possibly be given a different weighting compared to other factors in subsequent stages, such as the site comparison and final site(s) evaluation stages. For example, while the physical factors received higher priority rating at this scale of investigation, social and other factors will be considered at much greater detail in subsequent stages. Social, economic, and cultural factors are evaluated at an appropriate level of detail for the General Overview Analysis.

b) Application of Final Evaluation Factors

Potential impacts of establishing landfill activities in an area(s) are categorized as follows, for the final evaluation factors:

1. Unacceptable Impact
2. High Impact
3. Moderate Impact
4. Low Impact

The above impacts are essentially defined within the description of each of the final evaluation factors. The "unacceptable" impact categories were used to screen out areas that would be considerd unfavourable for landfill. The remaining areas were then evaluated on the basis of "High", "Moderate" or "Low" impact categories. With some factors, there is be a broader range of impact, such as "Low-Moderate" where an individual rating was considered inappropriate.

The general application of the evaluation factors was done using an overlay mapping technique. Separate mapping of the various factors was prepared to illustrate the areas affected by the "High", "Moderate" and "Low", levels of impact for each evaluation factor. In the case of the physical factors, the "low" impact areas were screened out based initially on hydrogeologically favourable factors, leaving preliminary areas that could be screened further using other factors. The various factors were then overlayed on the areas of "low" impact to identify impacts from the physical, social, economic, and cultural factors. The priorities shown below were applied to rank the groups of factors at the overview stage and to act as a guide in trading off among the various factors. Possible mitigating measures at the overview stage were considered in terms of the supplementary factors (see Section 4).

2.4 Priority Ranking of Evaluation Factors

To assist in establishing potential candidate areas, the groups of evaluation factors were prioritized in the following broad categories.

The first and second priority items are related to physical factors included in 2.1 under Group A. The third priority item covers those evaluation factors in Group B and D in 2.1. Finally, the fourth priority item covers the evaluation factors in Group C.

First Priority Item - Avoid disturbance or degredation of the natural environment, including landforms, natural habitats, major aquifers, preservation and conservation areas.

Second Priority Item - Maintain and preserve natural resource areas in Halton, where possible, such as agricultural lands, recreation areas, aggregate resource areas, and forestry areas.

Third Priority Item - Avoid community services and institutions of provincial, major regional or local cultural or social significance; and avoid areas of high population density.

Fourth Priority Item - Minimize the increase in costs to Halton residents for the provision of solid waste management services, including collection, distribution, and disposal.

2.5 Final Evaluation Factors

The final evaluation factors are generally described as to their purpose at the overview stage; identification of the specific evaluation factor to be used; and a description of the levels of impact that were applied for each evaluation factor.

The overview analysis for selection of candidate areas, proposed herein, varies from previous work in that it considers the use of damaged lands (quarries), low agricultural capability lands and the engineerability of potential landfill areas.

A. PHYSICAL FACTORS

A.1 SOILS/QUATERNARY GEOLOGY

A.1.1 Attenuation Capability

The purpose of examining soil types in the General Overview Analysis is to identify and rank the attenuating capabilities of the various soil materials in Halton and thereby determine the degree of protection they afford groundwater and surface water resources. In general, the finer grained soils are better attenuators than the coarser grained soils and, therefore, the potential impact for groundwater contamination is lowest for silt and clay. The type, composition and sequence of underlying and adjacent soils or geologic materials influences the extent to which groundwater may be contaminated. The hydraulic conductivity of the geologic materials is of considerable importance as well as the types of openings (fractures or intergranular pores) through which the groundwater moves.

The specific evaluation factor is Attenuation Capability. It is rated as follows:

Attenuation Capability	Impact
Glacial Outwash (sand and gravel deposits)	Moderate to high impact
Pleistocene Geologic complexes	Moderate impact
Till and clay plains	Low impact

A.1.2 Overburden Thickness

The thickness of overburden is also related to the degree of soil attenuation as this affects the migration of landfill contaminants in the subsurface.

The rating system considers the environmental effect of reducing overburden thickness by the removal of overburden for cover material.

The specific evaluation factor is Overburden Thickness. It is rated as follows:

Overburden Thickness	Impact
0 - 5m	High potential impact
5 - 15m	Moderate potential impact
15+ m	Low potential impact

A.1.3 Agricultural Capability

The feasibility of using low agricultural capability lands for landfilling was examined as an alternative to better agricultural areas that have been identified in previous site selection reports in Halton.

The specific evaluation factor is Agricultural Capability. It is rated according to three levels of impact, which are inversely related to the potential for nonagricultural land use activities. In other words, a high rating for agricultural capability would denote a high impact on agriculture.

Agricultural Capability	Impact
Class 1, 2, 3, 4	High impact on agriculture
Class 5, 6, 7	Low-Moderate impact on agriculture

A.2 TOPOGRAPHY AND LANDFORMS

A.2.1 Niagara Escarpment

Disposal at the slope face of the Niagara Escarpment will not be contemplated. The slope face will be considered to be that portion of the Escarpment where the slope exceeds 20 percent.

A.2.2 Slope

Terrain conditions suitable for landfill operations were examined. Generally, slopes exceeding 20 percent are considered unsuitable for landfill because of the difficulty of operating equipment on such slopes.

The specific evaluation factor is Slope. It is rated as follows:

Slope	Impact
Greater than 20%	High impact
0 - 20%	Low - moderate impact

A.3 SURFACE WATER

A.3.1 Drainage

In the overview process, a buffer zone between the landfill and major surface water courses was judged as desirable. The setback distance between a landfill and a major stream depends on the soil type, its attenuation capability and the assimilative capacity of the receiving stream.

For the purpose of the General Overview Analysis, a minimum setback distance of 100m will therefore be established to provide a buffer zone between a landfill and a major watercourse. Major watercourses are defined as those shown on the Regional Municipality of Halton Base Map. However, this approach, does not preclude modifications to the setback distance at the site comparison level, which would depend on site-specific conditions.

The specific evaluation factor is Distance from Major Watercourse. It is rated as follows:

Distance from Major Watercourse	Impact
Less than 100m	Unacceptable
More than 100m	Low - moderate

A.4 GROUNDWATER

A.4.1 Areas of High Infiltration

Areas of potential high groundwater recharge such as surficial sands and gravel and exposed or thinly covered dolostones were identified. The importance of this factor is dependent upon site-specific hydrogeologic conditions but in the overview process avoidance of such areas if possible is considered desirable.

The specific evaluation factor is Infiltration. It is be rated as follows:

Infiltration	Impact
Infiltration greater than 25cm/year	Potentially high impact
Infiltration 15-25cm/year	Moderate impact
Infiltration less than 15cm/year	Low impact

A.4.2 Buried Valley - Aquifer Complexes

Buried pre-glacial valleys have been identified in some areas of Halton. They frequently contain sand and gravel deposits that form major aquifers, such as the Georgetown aquifer. While solid waste disposal in these areas might be contemplated with proper environmental controls, it is desirable to avoid these areas if possible, given that there may be other areas in the Region without this constraint.

The evaluation factor is Buried Valley - Aquifer Complexes. It is rated simply as unacceptable where such areas are identified and would not be considered for landfilling.

A.4.3 Type and Distribution of Aquifers

Groundwater aquifers are characteristic of most areas in Ontario and are capable of supplying sufficient water, for domestic purposes at least. Consequently, some impact on local aquifers may occur wherever landfills are to be sited. Although impact on aquifers is reduced by natural attenuation and/or the collection and treatment of leachate, disposal on major municipal supply aquifers should be avoided if possible at this stage.

A.5 SUPPLEMENTARY FACTORS

A.5.1 Water Serviced Areas

Areas that are presently serviced with municipal water or that may be serviced in the 20 year planning period have been identified. Landfilling located along or near a major water pipeline may be advantageous in that water supply restoration would be ensured in the event of adverse environmental effects. This factor was developed in order to prioritize areas selected by other methods.

A.5.2 Engineerability

Most landfill sites can be engineered to prevent significant environmental degradation. The cost and complexity of such engineering systems depends on many other factors such as stratigraphic complexity, hydrology, availability of buffer areas, feasibility of on-site treatment and control of leachate, and distance to treatment facilities if required. While engineerability is an important consideration in the selection of alternative potential sites, it is not a pure overview factor at this stage. Consequently, the engineerability factor was applied as an additional factor after broad potential landfill areas had been selected by the overlay process of screening areas.

A.5.3 Landfilling in Quarries

Exposed rock areas may be considered generally unsuitable for solid waste disposal. The creation of new quarries in Halton specifically for solid waste disposal would also not be considered. However, there are existing unused quarries in Halton that were examined as possible landfilling areas. Some advantages of using quarries for landfilling in Halton include rehabilitation of damaged land and avoidance of a potential conflict with the use of good agricultural land. The common disadvantage of using quarries for landfilling is that such

areas may require extensive engineering to control leachate. If sufficient overburden cover material is lacking locally, a landfilling operation may not be feasible.

Operating quarries are judged undesirable for sanitary landfill. There are likely to be significant conflicts, particularly where the landfill operation is conducted by someone other than the owner/operator of the quarry. An active quarry that is extracting material, other than for cover, would have to be closely coordinated with the landfill process and its environmental control facilities.

Since the philosophy for siting a landfill in a quarry differs from the objective of natural attenuation, landfilling in quarries will be considered on a site-specific basis.

A.6 BIOPHYSICAL

A.6.1 Environmentally Sensitive Areas

At the initial screening level, the biophysical factor would involve identification of environmentally sensitive and/or significant areas. The Region has commissioned extensive work for the purpose of designating Environmentally Sensitive Areas (E.S.A.'s) in the Regional Official Plan. There have been 37 Environmentally Sensitive Areas identified, using nine criteria as the basis for selection of E.S.A.'s. Guidelines for the interpretation of each of the criteria have also been developed by the Region which are administered jointly by the Halton Planning and Development Department and the Halton Ecological and Environmental Advisory Committee. The criteria and guidelines for identification of E.S.A.'s in Halton appear to be well-argued and are currently applied in Halton for landfill sites.

All of the 37 E.S.A.'s identified by the Region were examined, including other candidate areas for E.S.A.'s in Halton, identified by appropriate agencies and individuals.

The levels of impact are based on the Regional criteria used to establish the Environmentally Sensitive Areas, and given a weighting for the overview stage. Thus, "unacceptable" areas are those that have either Criterion 2 or Criterion 6 (the latter signifies provincial or national status); "high" impact areas have one or more of Criteria 4, 5, 7, or 6 at the regional status level; moderate impact areas have one or more of any of the other criteria. The rating is only a guide for possible trade-offs at the site comparison level in areas near ESA's.

The factors were used to classify sensitive areas and other significant areas identified by the Ministry of Natural Resources and Conservation Authorities.

Environmentally Sensitive and/or Significant Areas	Impact
The ecological function of the area contributes significantly to the maintenance of a natural system beyond its boundaries by serving as a water storage, recharge, or discharge area, important wildlife migratory stopover or concentration point, or a linkage of suitable habitat between natural biological communities; or The area provides habitat for rare or endangered species that are endangered Provincially or Nationally.	Unacceptable
The area is a habitat with limited representation in the Region, Ontario or Canada or a small remnant of particular habitats that have virtually disappeared within the Region; or	High

The area has an unusually high diversity of biological communities; or The area is large, affording a habitat for species requiring extensive blocks of suitable habitat; or The area provides habitat for rare or endangered species that are endangered Regionally; or Areas adjacent to areas identified above as being 'unacceptable'.	High (continued)
The area represents a distinctive and unusual landform within the Region, Ontario or Canada; or The plant and/or animal communities are identified as unusually high quality within the Region, Ontario or Canada; or The area is particularly suitable for scientific research and conservation education purposes; or The area has high aesthetic value in the context of the surrounding landscape) or, Areas adjacent to areas identified above as 'High' impact.	Moderate
Areas lying adjacent to areas identified above as 'Moderate' impact.	Low

A.7 LAND USE

The purpose of this land use evaluation factor at the initial screening level is to identify existing and proposed built-up areas, essentially "Urban Areas", "Hamlets" and "Rural Clusters" (as identified in the Regional Official Plan, The Regional Concept, Map 1 and in the Halton Region Rural Cluster Study, June 1982). These areas, as identified, embody the extent of planned areas of concentrated residential development within the Region over the long-term (balance of the 20th Century). Plans affecting land use prepared by Area Municipalities, the Province and other agencies were also be identified in order to maintain a consistent approach.

Agriculture, recreation and other resource lands were identified in the review of the Regional Official Plan (Section 6).

The specific evaluation factor is Compatibility with Existing and Planned Land Use. It was evaluated as follows:

Compatibility with Existing and Planned Land Use	Impact
Within or adjacent to existing built-up areas and/or existing hamlets or rural clusters	Unacceptable
Within or adjacent to planned urban areas or planned rural clusters	High
Within 1.6 km of the designated areas, as above	Moderate
More than 1.6 km of the designated areas, as above	Low

It should be noted that Provincial, Regional, and local Plans affecting the siting of waste disposal facilities in Halton were reviewed. Relevant policies from these Plans which affect the environmental factors to be used at the overview stage have been identified in Section 6.

A.8 TRANSPORTATION

Potential transportation impacts related to establishing potential landfilling areas were evaluated under the factor Traffic Service & Safety. This factor was used to indicate the general travel condition changes that are likely to occur on the Region's road network (existing and planned) as a result of landfill activities. The suitability of an area for landfilling with respect to transportation was evaluated by the classification, condition and proximity of roads accessing the area.

Areas within the Region that are well serviced by provincial highways and primary and secondary arterials are considered generally more attractive for landfilling from a transportation standpoint. These highways and arterials are more appropriate locations for landfill-related traffic than local roads due to:

- operating conditions (travelling speed, geometry, conflicts with local traffic, etc.);
- nature of/control of adjacent land uses;
- traffic volumes.

The following 'area' conditions were used to categorize potential transportation impacts:

A. The area is not adequately serviced for landfilling activities by provincial highways.

B. The area is not adequately serviced for landfilling activities by primary or secondary arterials.

C. Local terrain, road conditions and adjacent land use along local roads are not suitable for road upgrading to arterial standards.

D. Disruption of local traffic would result with the introduction of haulage vehicles on area roads.

E. Potential vehicle-pedestrian conflicts could exist.

The specific evaluation factor is Traffic Service and Safety. It is rated as follows:

Traffic Service and Safety	Impact
A, B, C, D and E	Unacceptable
A, B, D & E or A, B, D	High
A	Moderate
None of the above	Low

B. SOCIAL FACTORS

B.1 POPULATION DENSITY

Population density for urban and rural areas was identified within the context of Halton. The methods of determining appropriate population density levels was based on a review of current provincial and regional statistical information for Halton communities. The evaluation factor was applied using the four levels of impact and the principle of high urban population density was directly related to the high impact level.

Therefore, areas of high urban population density will be generally avoided at the initial screening level due to the potential adverse effects of landfilling activities on heavily populated areas. The population density parameters employed are as follows:

Population Density	Impact
400 persons/square kilometre or greater	Unacceptable
200-399 persons/square kilometre	High
100-199 persons/square kilometre	Moderate
Less than 100 persons/square kilometre	Low

B.2 COMMUNITY SERVICES AND INSTITUTIONS

At the initial screening level, areas which include community facilities of Provincial and/or Regional status are avoided, where possible. Such areas would be considered particularly sensitive to the potential impacts of landfilling activities.

The following factors were used to evaluate impacts on community services and institutions:

Community Service and Institutions	Impact
Locally unique, provincial and regional-serving facilities including provincial parks, conservation areas, the Bruce Trail	Unacceptable
Major, regional serving facilities characterized by large, temporary populations and/or with special siting criteria including hospitals, correctional facilities, airfields, colleges, high schools	High
Regional and community serving facilities with generally lower temporary populations including elementary schools, homes for the aged, nursing homes, major community centres. Regionally significant social or cultural features including cemeteries, parkway belt, museums	Moderate
Facilities with lower temporary populations and/or seasonal populations including municipally designated open space, public and private recreation facilities including golf courses, race tracks, drive-ins	Low

Important scenic features which form part of the Region's cultural landscape were incorporated where possible with the above description of social and cultural factors. The potential impacts of landfilling activities in such areas are considered undesirable and, therefore, landfilling should be avoided.

C. ECONOMIC FACTORS

C.1 LAND COSTS

Anticipated per-acre purchase price will be evaluated at the overview stage. This indicator will be based on broad selling price averages for potential landfill areas.

The specific evaluation factor is Land Costs. It would be rated as follows in 1982 Dollars:

Land Costs	Impact
Above $50,000/ha. (approx. $20,000/acre)	High
$10,000-$50,000/ha (approx. $4,000-$20,000/acre)	Moderate
Below $10,000/ha (approx. $4,500/acre)	Low

C.2 HAUL COSTS

The purpose of this evaluation factor is to analyze and compare the cost of moving waste from generation areas to the potential areas of landfill within various Regional sectors.

The specific evaluation factor is Haul Costs. It would be rated as follows:

Haul Costs	Impact
$13.00-$19.00/tonne	High
$8.00-$13.00/tonne	Medium
$2.00-$8.00/tonne	Low

While potential site development and operation costs are relevant to the selection of a landfill site, these costs are highly site specific and cannot be used as factors at this stage of the analysis. Site development and operation costs will be used in the evaluation process at a subsequent stage when specific sites have been identified.

D. CULTURAL FACTORS

D.1 HISTORICAL

The purpose of the historical evaluation factor at the overview stage is to ensure that historical sites, properties and buildings are protected and left undisturbed wherever possible. Areas which include known historical sites of National, Provincial, Regional and local status will be identified. Potential historical site designations will also be identified from available existing information.

For the purpose of the overview analysis, Areas of Known and Potential Historical Sites is the specific evaluation factor. Such areas will be avoided at the initial screening level unless the area is considered suitable for landfilling from the evaluation of other factors. Therefore, the factor is not an absolute constraint at this level.

D.2 ARCHAEOLOGICAL RESOURCES

It is intended that locations of all registered and known archaeological sites in Halton will be identified. Archaeological information for this stage will be provided from a recent study prepared specifically for the Halton Environmental Assessment by the Museum of Indian Archaeology.

The presence of known archaeological sites within a potential area identified for landfilling will not be an absolute constraint. However, the presence of such sites will be documented and, at the next level of detail, further investigations of known archaeological sites would be undertaken to establish a more thorough understanding of site potential within the defined area(s).

SECTION 3 - HYDROGEOLOGICAL ANALYSIS

3.1 Methodology

In the preparation of the "Draft" and "Final Evaluation Factors, Phase 2, Stage 2A, General Overview Analysis" reports, evaluation factors and supplementary factors were selected that reflect current concepts on the siting of environmentally suitable sanitary landfill sites as they pertain to the Region of Halton. Due consideration was also given to the possible preservation of agricultural lands and the use of quarries. The main evaluation factors were intended to eliminate less desirable areas in the Region from further consideration for landfilling while the supplementary factors were used to refine site selection, where appropriate. The following evaluation factors were adopted:

- Attenuation capability
- Overburden thickness
- Agricultural capability
- Niagara Escarpment
- Slope
- Drainage
- Areas of high infiltration
- Buried valley - aquifer complexes
- Type and distribution of aquifers

Supplementary factors were deemed to include:

- Water serviced areas
- Engineerability
- Landfilling in quarries

From the analysis of each of the above factors, a judgement was made as to the potential level of impact a sanitary landfill could have on the natural environment (unacceptable, high, moderate or low) to develop a ranking system for environmental impact. For some factors, the potential effects on landfill operations was also considered (i.e slope).

The methodology and data used in site selection by Gartner Lee/Dillon in 1976, was reviewed. These data were updated where required (e.g. Ministry of the Environment water well records recorded subsequent to 1976, published and unpublished reports, etc.) and additional constraints outlined above were applied. Gartner Lee Limited's mapping of water well information proved to be valuable in the assessment of overburden thickness, aquifer distribution and buried valley locations. Differences in suitable areas sizes and locations can be mainly attributed to the use of a greater number of evaluation factors in this analysis.

Following the assembly and review of available representative data and reports and discussions with various authorities, the mapping of individual factors described above was undertaken on a series overlays. By superimposing maps of individual factors, the areas of low impact were identified. Subsequently the remaining evaluation factors, (i.e. land use, social economic, cultural and biophysical) were applied as overlays to the hydrogeological areas of "low" impact to determine the most suitable potential candidate areas for the landfill component of the waste management system.

3.2 Evaluation Factors

Most of the evaluation factors were selected because they related to the environmental security offered to water resources. They are simple factors that in themselves do not define environmental integrity, but when combined with other factors, portray the suitability of areas for landfilling. For example, the factor "Overburden Thickness" itself does not indicate the degree to which landfill contaminants will be attenuated, until combined with "Attenuation Capability". Thick overburden in moderate to poor attenuating sand and in an area with an overburden thickness greater than 15 metres (low potential impact), would not be an optimal area, if the overburden in that area is predominately sand and gravel (high potential impact).

The following sections describe the evaluation of hydrological and hydrogeological factors in detail:

3.2.1 Attenuation Capability

3.2.1.1 Objective

To identify and rank the attenuating capabilities of the various soil materials in Halton, and thereby determine the degree of protection they afford groundwater and surface water resources.

3.2.1.2 Description and Significance

The type, composition and sequence of soils or geologic materials influences the extent to which groundwater and surface water may be contaminated. The hydraulic conductivity of the geologic materials is of considerable importance as well as the types of openings (fractures or intergranular pores) through which the groundwater moves.

In general, finer grained soils are better attenuators of landfill leachate than coarser grained soils. In other words, fine grained soils provide a greater degree of natural protection for groundwater resources. Therefore, the potential for groundwater contamination is lowest for silt and clay soils.

3.2.1.3 Rating

The evaluation factor rating is based on two concepts. First, finer grained soils provide better soil attenuation capabilities than coarser grained soils. Therefore, glacial till and clay plains with relatively high percentages of fine grain materials possess high soil attenuation capabilities and the environmental impact of landfilling in these areas is low. Sand and gravel areas (i.e. glacial outwash) possess a low to moderate soil attenuation capability and the environmental impact of landfilling in these areas is moderate to high. Second, it is desirable to locate a landfill in an environment that contains predictable and thus relatively uniform soil

characteristics. Complex geologic environments are judged to possess uncertain soil attenuation capabilities where detailed studies are unavailable. For screening purposes, they have been judged to have a moderate attenuation capability.

In summary, the soil attenuation capability factor has been rated as follows:

Attenuation Capability	Impact
Glacial Outwash (sand and gravel deposits)	Moderate - high impact
Pleistocene geologic complexes	Moderate impact
Till and Clay Plains	Low impact

3.2.1.4 Results

An overlay map identifying the above soil attenuation categories and potential environmental impacts was produced for Halton at a scale of 1:50,000.

Two broad areas of high soil attenuation capability and thus low environmental impact were identified. These comprise areas of the Wentworth till in the northwest portion of the region and the Halton till found east of the Niagara Escarpment. Major areas of low soil attentuation capability, and thus high environmental impacts are found along the Lakeshore and in the Halton Hills area where sandy overburden deposits prevail.

SOURCES OF INFORMATION

To identify and rank soil attenuation capabilities the following reports and maps were consulted:

1983:
Karrow P.F., "Quaternary Geology of the Hamiton Area"; Southern Ontario; Ontario Geological Survey, Map 2605, Gelogical Series - Preliminary Map, Scale 1:50,000.

1983:
Karrow, P.F., "Quaternary Geology of the Cambridge Area"; Southern Ontario; Ontario Geological Survey, Map 2604, Geological Series - Preliminary Map, Scale 1:50,000.

1982:
"Aggregate Resources Inventory of the Town of Milton", Regional Municipality of Halton; Ontario Geological Survey, Aggregate Resources Inventory Paper 47.

1982:
"Aggregate Resources Inventory of the City of Burlington". Regional Municipality of Halton; Ontario Geological Survey, Aggregate Resources Inventory Paper 45.

1982:
"Aggregate Resources Inventory of the Town of Halton Hills", Regional Municipality of Halton; Ontario Geological Survey, Aggregate Resources Inventory Paper 46.

1979:
Ostry, R.C., "The Hydrogeology of the IFYGL Forty Mile and Oakville Creeks Study Areas", Water Resources Report 5b, Ontario Ministry of the Environment.

1969:
Funk, G., "Geology and Water Resources of the East and Middle Oakville Creeks, IHD Representative Basin", Water Resources Report 12, Ontario Ministry of the Environment.

1968:
Karrow, P.F., "Pleistocene Geology of the Guelph Area", Geological Report No. 61, Ontario Department of Mines, Map 2153.

1966:
Hewitt, D.F. Brampton Area, West Sheet, Southern Ontario; Ontario Department of Mines, Preliminary Geological Map No. P413, Industrial Mineral Resources, Scale 1:50,000.

1966:
Hewtt, D.F. Brampton Area, East Sheet, Southern Ontario; Ontario Department of Mines,, Preliminary Geological Map No. P414, Industrial Mineral Resources, Scale 1:50,000.

1966:
Chapman L.J., Putnam D.F., "The Physiography of Southern Ontario", Ontario Research Foundation, University of Toronto Press.

3.2.2 Overburden Thickness

3.2.2.1 Objective

To identify and rank oveburden thickness categories in the Region and assess the level of environmental protection offered by each thickness category .

3.2.2.2 Description and Significance

Overburden thickness relates to the distance landfill contaminates migrate in the subsurface and to soil attenuation. Areas underlain with thick sequences of overburden provide better environmental security to surface water and groundwater resources than areas underlain by thin sequences of overburden.

3.2.2.3 Rating

The rating system considers the environmental effect of reducing overburden thickness by the removal of overburden for cover material. It is ranked as follows:

Overburden Thickness	Impact
0 - 5 metres	High potential impact
5 - 15 metres	Moderate potential impact
15+ metres	Low potential impact

3.2.2.4 Results

An overlay map identifying the three overburden thickness categories was produced for Halton at a scale of 1:50,000.

Areas where overburden exceeds 15 metres in thickness are generally found east of the Niagara Escarpment. Some inclusions of thick overburden sequences are also found in th northwest portion of the Region above the Escarpment. Thin overburden sequences generally occur along the Lakeshore and the Escarpment areas.

SOURCES OF INFORMATION

The following reports and maps were consulted:

1983:

Water Well records (up to June, 1983), Ontario Ministry of the Environment.

1979:
Funk, G., Map 3 - Overburden Thickness, Scale 1:50,000. "Geology and Water Resources of the Middle Oakville Creeks, IHD Representative Drainage Basin", Water Resoures Report 12, Ontario Ministry of the Environment.

1979:
Coward, J.M. et al, Map 5 - Overburden Thickness, Scale 1:50,000. "Hydrogeology and Groundwater Model of the Blue Springs Creek, IHD Representative Drainage Basin", Water Resources Report 10, Ontario Ministry of the Environment.

1976:
Gartner Lee Associates, Inventory Maps, Resurce Recovery Study, Region of Halton.

1969:
Hewitt, D.F., Drift thickness sheet, Brampton Area, Map 2170. Scale 1:63,360.

1968:
Vos, M.A. Drift thickness series, Galt Hamilton sheet Southern Ontario, Ontario Department of Mines, Preliminary Map No. P. 535. Scale 1:50,000.

1968:
Vos, M.A., Drift thickness series, Guelph sheet, Preliminary Map No. P. 345. Ontario Department of Mines, Scale 1:50,000.

3.2.3 Agricultural Capability

3.2.3.1 Objective

To identify low agricultural capability lands and to assess the feasibility of using these lands for landfilling.

3.2.3.2 Description and Significance

The soil capability for agriculture map groups soils in the region into several classes based on their capability to produce common field crops. The higher the capability, the better the productive capacity on a sustained cropping basis. The maps show the general distribution of the capability classes, and show the limitations to agricultural production and use.

Impact, in this case, refers to the potential loss of existing viable agricultural lands to other land uses (i.e. landfilling).

3.2.3.3. Rating

For the purpose of the overview analysis, two levels of impact were used. A high rating for agariculture capability (i.e. Class 1 lands) denotes a low rating for landfilling. In other words, landfilling on lands that would otherwise be utilized for agriculture may be a poor allocation of available land resources. For the overview, fifty percent Class 5 was included in the low-moderate category. The following rating was adopted for agricultural capability:

Agricultural Capability	Impact
Class 1, 2, 3, 4	High impact on agriculture
Class 5, 6, 7	Low-moderate impact on agriculture

This rating is based on the goals and objectives of the Foodland Guidelines and the Halton Region Official Plan.

3.2.3.4 Results

An overlay map identifying the two Agricultural impact categories was produced for Halton at a scale of 1:50,000.

Landfilling on most lands east of the Niagara Escarpment will have a high impact on agriculture. In this area, there are only one or two small inclusions of land where the impact of landfilling on agricultural would be low to moderate.

By and large, the predominant areas of low agricultural capability are found in the northwest portion of the Region above the Niagara Escarpment.

SOURCES OF INFORMATION

The Canada Land Inventory, Soil Capability for Agriculture Map 1:50,000.

Official Plan for the Halton Planning Area

The Foodland Guidelines (1978), Government of Ontario.

3.2.4 Niagara Escarpment

3.2.4.1 Objective

To preserve the aesthetic of prominent rock cliffs (slope faces) on the Niagara Escarpment.

3.2.4.2 Description and Significance

Prominent rock cliffs are found at many locations within the Niagara Escarpment Planning Area. At these locations, the bedrock protrudes

from surrounding overburden material exposing the geologic character of the Niagara Escarpment. These slopes are unique to the Southern Ontario landscape.

3.2.4.3 Rating

Identified rock cliffs or slope faces are judged to be unacceptable for landfilling and are eliminated from further consideration by the overview process.

3.2.4.4 Results

An overlay map identifying the slope faces was produced for Halton at a scale of 1:50,000. Restricted areas in this category occur sporadically in the City of Burlington and as a continuous feature centered about the urban area in the Town of Milton.

SOURCES OF INFORMATION

"Soils of Halton County, Report No. 48 of the Ontario Soil Survey", Canada Department of Agriculture and the Ontario Agricultural College - Scale 1:63,360.

3.2.5 Slopes

3.2.5.1 Objective

To identify and rank terrains that, because of slope conditions, would be difficult to prepare and operate for landfilling.

3.2.5.2 Description and Significance

The impact of this evaluation factor relates to landfill operations and not the impact on the natural environment. The suitability of terrain conditions were examined because of the difficulty and higher cost of operating landfill equipment on steep slopes.

3.2.5.3 Rating

The rating was based on the working limit for most earth moving equipment. It was determined that terrain with long slopes greater than 20 percent, would be difficult to prepare for landfilling. This does not preclude the possibility of starting an excavation that cuts into a steep slope or from constructing a fill adjacent a slope steeper than 20 percent.

The slope factor is rated as follows:

Slope	Impact
Greater than 20%	High impact
0 - 20%	Low - moderate impact

3.2.5.4 Results

An overlay map was prepared to identify the two slope categories for the Region. This map was produced at a scale of 1:50,000.

Virtually all slopes greater than 20 percent in the Region are associated with the Niagara Escarpment and are prominent in areas northeast of Milton and in the vicinity of Georgetown.

SOURCES OF INFORMATION

The following maps were used to identify and map regional slope conditions:

"Soils of Halton County, Report No. 43 of the Ontario Soil Survey", Canada Department of Agriculture and Ontario Agricutural College, Scale 1:63,360.

Topographic maps, National Topographic Series, Scale 1:50,000.

3.2.6 Drainage

3.2.6.1 Objective

To reduce the possiblity of contaminating major surface water courses in the Region.

3.2.6.2 Description and Significance

In terms of the overview analysis, perennial streams are considered to be major streams. There is a potential danger that contaminants may leach from landfills and migrate to surface waters. Contaminants may travel as run-off or through the ground water. Thus, it is desirable to locate a site suitably setback from these watercourses.

It should be recognized that due to the Regional scale of the overview analysis, some lesser watercourses may not have been identified and may warrant further consideration during the more detailed studies in the Environmental Assessment.

3.2.6.3 Rating

In deciding a suitable setback from watercourses, simplifying assumptions have been employed. Otherwise, rating this factor would be site specific and far too complex for the purposes of an overview analysis. First, mitigation such as stream rerouting has not been considered at this time. Second, sufficient distances must be provided for some natural attenuation between a site and a stream as well as an area in which leachate control works can be installed if the need arises. Based on these assumptions and after consultation with the Ministry of the Environment, a minimum setback distance of 100 metres was established. The following rating system resulted:

Distance from Major Watercourses	Impact
Less than 100 m	Unacceptable
More than 100 m	Low-moderate

3.2.6.4. Results

An overlay at a scale of 1:50,00 was prepared with 100 metre setbcks from major watercourses. The map showed a fairly regular distribution of drainage constraints throughout the Region.

SOURCES OF INFORMATION

Major watercourses were identified as those on the Regional Municipality of Halton Base Map.

3.2.7 Infiltration Areas

3.2.7.1 To identify areas of potentially high groundwater infiltration.

3.2.7.2 Description and Significance

In the context of this study, infiltration is the estimated amount of precipitation that enters the groundwater flow systems from surface. The importance of this factor is site specific, but it was deemed desirable to consider it in the overview analysis. In areas of high infiltration (high groundwater recharge) more pollutants will be leached out of solid waste and could create greater groundwater and surface water impacts.

3.2.7.3 Rating

The interpreted infiltration rate categories were based on experience, a literature review of water budgets in the area and soil and geologic conditions in the Region. It was concluded that high rates of infiltration will occur in sand and gravel areas, moderate rates in sand till and dolostone outcrop complex areas and low rates in silt till and shale outcrop complex areas.

The rating for this factor is as follows:

Infiltration	Enviornmental Impact
Infiltration 25 cm/yr.	Potentially high impact
Infiltration 15-25 cm/yr.	Moderate impact
Infiltration 15 cm/yr.	Low impact

3.2.7.4 Results

An overlay map identifying the three infiltration categories was prepared for Halton at a scale of 1:50,000.

The high infiltration areas of surficial sand and gravel (25 cm/yr.) are found randomly scattered throughout the Region. Moderate infiltration areas generally occur above the Escarpment in the dolostone outcrop complex and in the northwestern corner of the Region where the Wentworth till (a sandy till) overlies dolostone of the Amabel formation. Areas of low infiltration are generally located below the Escarpment where the silty Halton till outcrops and in areas of shale outcrop complex near the Lakeshore.

SOURCES OF INFORMATION

Regional infiltration rates were interpreted and deduced from soils and geologic maps. Portions of the following maps and reports were reviewd in terms of this factor.

1983:
Karrow P.F., "Quaternary Geology of the Hamilton Area"; Southern Ontario; Ontario Geological Survey, Map 2605, Geological Series - Preliminary Map, Scale 1:50,000.

1983:
Karrow, P.F., "Quaternary Geology of the Cambridge Area"; Southern Ontario; Ontario Geological Survey, Map 2604, Geological Series - Preliminary Map, Scale 1:50,000.

1982:
"Aggregate Resources Inventory of the Town of Milton", Regional Municipaliy of Halton; Ontario Geological Survey, Aggregate Resources Inventory Paper 47.

1982:
"Aggregate Resources Inventory of the City of Burlington". Regional Municipality of Halton; Ontario Geological Survey, Aggregate Resources Inventory Paper 45.

1982:
"Aggregate Resources Inventory of the Town of Halton Hills", Regional Municipality of Halton: Ontario Geological Survey, Aggregate Resources Inventory Paper 46.

1979:
Ostry, R.C., "The Hydrogeology of the IFYGL Forty Mile and Oakville Creeks Study Areas", Water Resources Report 5b, Ontario Ministry of Environment.

1979:
Coward, J.M.J. et al, "Hydrogeology and Groundwater Model of the Blue Springs Creek IHD Representative Basin", Water Resources Report 10, Ontario Ministry of the Environment.

1969:
Funk, G., "Geology and Water Resources of the East and Middle Oakville Creeks, IHD Representative Basin", Water Resources Report 12, Ontario Ministry of the Environment.

1968:
Karrow, P.F., "Pleistocene Geology of the Guelph Area", Geological Report No. 61, Ontario Department of Mines, Map 2153.

1966:
Hewitt, D.F. Brampton area, West Sheet, Southern Ontario; Ontario Department of Mines, Preliminary Geological Map No. P413, Industrial Mineral Resources, Scale 1:50,000.

1966:
Hewitt, D.F., Brampton Area, East Sheet, Southern Ontario; Ontario Department of Mines, Preliminary Geological Map No. P414, Industrial Mineral Resources, Scale 1:50,000.

3.2.8 Buried Valley - Aquifer Complexes

3.2.8.1 Objective

To map identified pre-glacial buried valleys that potentially contain major overburden aquifers.

3.2.8.2 Description and Significance

The existence of buried valley-aquifer complexes in the Region of Halton has long been known to the hydrogeologic community. Buried valleys are steep-walled gorges or significant local depressions in an otherwise gently sloping bedrock surface. These valleys were probably cut by pre-glacial rivers and deepened by glacial action. Frequently, these valleys contain sand and gravel deposits and thus potentially form major aquifers. To date, extensive exploration of these buried valleys has not been carried out, consequently, their locations are highly interpretative.

3.2.8.3 Rating

Because of the possibility of significant groundwater resource associated with buried valleys, it is desirable to avoid these areas at the overview stage. Consequently, the areas identified as possible buried valley aquifer complexes are judged to be unacceptable for landfilling and have been eliminated from further consideration.

3.2.8.4 Results

An overlay map prepared at a scale of 1:50,000 identifies four possible buried valley-aquifer complexes. These valleys are in the following general localities:

- Bronte Creek
- Georgetown
- South of Drumquin
- Campbellville
- Kelso/Hornby

SOURCES OF INFORMATION

Buried valleys were mapped with the assistance of the following information sources:

1983:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Lowville", City of Burlington, Regional Municipality of Halton, Project No. PR-722.

1980:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Kilbride", Regional Municipality of Halton, Project No. PLR-597.

1979:
Karrow, P.F., Miller R.F., Farrel, L., "Bedrock Topography of the Cambridge Area", Southern Ontario, Ontario Geological Survey Preliminary Map P. 1985.

1978:
Karrow, P.F., Miller R.F., L., Bedrock Topography of the Guelph Area, Southern Ontario, Ontario Geological Survey Preliminary Map P. 224.

1978:
Hydrology Consultants, "Groundwater Study of the Georgetown Area" for the Regional Municipality of Halton, Project No. PR-372.

1978:
Hydrology Consultants, "Preliminary Assessment; Groundwater Supply Liquid Waste Disposal, Residential Subdivision, Campbellville, Ontario".

1976:
Gartner Lee Associates, Inventory Maps Resource Recovery Study, Regional Municipality of Halton.

1965:
Bedrock topography of the Hamilton Area, Southern Ontario, Map 20-34.

1963:
Karrow, P.F., "Pleistocene Geology of the Hamilton-Galt Area" Geological Report No . 16, Ontario Department of Mines.

3.9.1 Type and Distribution of Aquifers

3.9.1.1 Objective

To avoid degradation of major supply aquifers from landfill contaminants.

3.9.1.2 Description and Significance

Within the Region, groundwater supplies are derived from aquifers of the following general types: surface sand and gravel deposits, sand and gravel beds and lenses that occur deeper in the overburden, fractured dolomitic bedrock, weathered and fractured zones in the Queenston and Georgian Bay shales.

Overburden deposits containing coarse, sorted materials such as sand and gravel, are the most important aquifers for the development of high capacity wells. Sand, though less permeable, is able to transmit substantial quantities of water. The bedrock yields various quantities of water, depending on the rock type and the development of recording porosity and permeability. Yields from wells completed in dolostone are generally good with the Amabel formation forming one of the best bedrock aquifers in the Province. Yields from wells drilled in shale are generally small and frequently of poor quality.

3.9.1.3 Rating

Our analysis was directed to identify major municipal supply aquifier in the overburden and bedrock. Significant costs would be required to mitigate severe aquifer degradation should these become contaminated. Consequently, the areas identified as major supply aquifers are judged to be unacceptable for landfilling and are eliminated from further consideration by the overview process.

3.9.1.4 Results

Separate overlay maps for overburden aquifers and bedrock aquifers were prepared. These regional maps are at a scale of 1:50,000.

Several major overburden aquifers proved to be sensitive to this analysis. Municipal aquifers occuring in the vicinity of Lowville, Milton and Geogetown warrant protection.

Above the escarpment, the Amabel formation is a major groundwater aquifer that is capable of yielding municipal supplies in some areas, but present planning does not indicate an intention to develop major settlements in the near future. The presence of existing settlements (e.g. Kilbride, Campbellville, etc.) would have to be considered in the siting of any landfills above the Escarpment, but this factor is generally not a major constraint in this area.

SOURCES OF INFORMATION

The following information sources were used to map aquifers:

1983:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Lowville", City of Burlington, Regional Municipality of Halton, Project No. PR-772.

1983:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Mount Nemo:, City of Burlington, Regional Municipality of Halton, Project No. PR-723.

1983:
Hydrology Consultants, "Hydrogeological Investigation for the Rural Community of Hornby, Town of Halton Hills", The Regional Municipality of Halton, Project No. PR-718.

1983-1975:
Ontario Ministry of the Environment Water Well Records.

1982:
Hydrology Consultants, "Hydrogeological Investigation of the Hamlet of Brookville", Town of Milton, The Regional Municipality if Halton, Project No. PR-665.

1982:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Moffat", The Regional Municipality of Halton, Project No. PR.-666.

1980:
Hydrology Consultants, "Hydrogeological Investigation for the Hamlet of Kilbride", Regional Municipality of Halton, Project No. PR-597.

1979:
Ostry, R.G. Bedrock Geology and Topography. "The Hydrogeology of the IFYGL Forty Mile and Oakville Creeks Study Areas", Water Resources Report 5b, Ontario Ministry of the Environment.

1979:
Funk, G., "Geology and Water Resoures of the East and Middle Oakville Creeks IHD Representative Drainage Basin", Water Resources Report 12, Ontario Ministry of the Environment.

1978:
Hydrology Consultants, "Preliminary Assessment Groundwater Supply Liquid Waste Disposal, Residential Subdivision, Campbellvelle, Ontario".

1978:
Hydrology Consultants, "Groundwater Study of the Georgetown Area", Regional Municipality of Halton, Project No. PR-372.

1976:
Gartner Lee Associates, Inventory Maps, Resource Recovery Study, Region of Halton.

1974:
Telford, P.G., and Baker, D., Paleozoic Geology of the Guelph Area, Southern Ontario, Ontario Division of Mines, Preliminary Map P. 955, Geol. Ser., Scale 1:50,000.

1974:
Telford, P.G.,, Bond, I.J., and Liberty, B.A., Paleozoic Geology of Brampton Area, Southern Ontario, Ontario Division of Mines, Preliminary Map P. 958, Geol. Ser., Scale 1:50,000.

1972:
Paleozoic Geology of Hamilton, Ontario Division of Mines, Map 2336, Scale 1:50,000.

1965:
"Water Resources Survey, County of Halton", Ontario Water Resources Commission.

SECTION 4 - SUPPLEMENTARY FACTORS

Compilation of the overlays from hydrological and hydrogeological previous factors described in Section 3 results in broad areas where the impact from landfilling would be low. Considerations of supplementary factors such as water serviced areas and engineerability is intended to refine the number of potential candidate areas, where appropriate. Landfilling in quarries is considered in this section, since the philosophy for siting a landfill in a quarry differs from the philosophy of siting a landfill in a natural soil attenuation environment.

4.1 Water Serviced Areas

The position of a landfill in relation to water service areas could be important. Should local aquifers be degraded from landfill contaminants, it may be possible to restore supplies with connection to municipal water supply.

Operation maps supplied by the Region's Engineering Department were used to prepare an overlay showing areas presently serviced with municipal water. Amendment No. 2 to the Official Plan for the Halton Planning Area defines areas that may be serviced with water in the 20-year planning period.

Current and future water serviced areas were identified in Burlington Oakville, Georgetown, Milton and Acton.

4.2 Engineerability

Most landfill sites can be engineered to prevent significant environmental degradation. The cost and compelexity of such engineering systems depends on many other factors such as stratigraphic complexity, hydrology, availability of buffer areas, feasibility of on-site treatment and control of leachate, and distance to treatment facilities if required. While engineerability is an important consideration in the selection of alternative potential sites, it is not a pure overview factor at this stage. Consequently, the engineerability factor will be considered as an additional factor after broad potential landfill areas have been selected by other means.

A consultation held with the Ministry of the Environment Design Approvals official yielded the following general principles to be applied in site selection and engineering:[2]

1. There is no written policy on landfill site engineering.
2. Two landfill systems are acceptable to the Ministry -
   a) A natural attenuation site with an engineered back-up system.
   b) An engineered primary control system with a natural attenuation back-up.
3. The Approvals Branch has no strong preference for either of the above options.
4. A high degree of reliance on engineered systems as mitigation measure to correct inferior hydrogeologic factors may not be acceptable.
5. A highly engineered site with an engineered contingency back-up sited on or in important groundwater of surface water resources would not be approved.
6. Hydrogeologic characteristics should be favourable before other factors are considered in site selection.
7. The Ministry may not favour the use of limestone quarries for waste disposal (point 5 above).
8. The use of sewage treatment plants for treating leachate is accceptable (depending upon the type and capacity of plant, etc.).
9. With respect to the use of surface water for leachate assimilation -
   a) Policy One streams have no assimilative capacity.
   b) Policy Two streams may be allowed some impact.
10. Boundary impact criteria will be set at any site. They will depend on site specific conditions and water resources uses.

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[2]Meeting with Mr. P. Isles and Mr. G. Donnelly, July 21, 1983.

4.3 Landfilling in Quarries

As part of the overview process pits and quarries in Halton were examined to see whether or not some of them might offer an alternative to using agricultural land for waste disposal. This option was taken in response to the strong objection from the agricultural community and in recognition of the general concern that high grade agricultural land of southern Ontario is being taken out of production to satisfy non-agricultural purposes.

A total of 55 pits and quarries were inventoried and considered on a reconnaissance basis. Most of these were rejected because of obvious deficiencies such as, too small in size, and/or complications related to current land uses.

Seven quarries were selected, which appear to have fewer constraints and which seemed to offer potential as a regional landfill site. The locations of these are shown on Figure 7 in Section 1. They are described below briefly:

The identification of the named quarries should not be misconstrued as evidence that these are necessarily favourable sites for a sanitary landfill. Rather, it should be understood that these areas, on the basis of the overview analysis, stand out as offering potential. The site specific characteristics of the individual pits and quarries will be examined closely during the site selection stage of the study, which follows the overview stage.

It is true that much benefit might be derived through the use of these non-agricultural areas, but we must recognize that such sites may require considerable engineering to mitigate less than desirable physical features.

It may be worth noting that Metro Toronto, which buries close to half of all the garbage produced in Ontario currently uses only abandoned, engineered aggregate pits for sanitary landfill and has done so for many years without obvious bad effects. The same is true for many other municipalities. Thus, this option warrants full and careful consideration in Halton.

4.3.1 National Sewer Pipe

Located in the Town of Burlington, in the vicinity of King Road and the North Service Road of Highway 403, this site has been the subject of several intensive hydrogeologic investigations to assess its suitability for sanitary landfill. This site is underlain by red and green shale of the Queenston formation. It is cut by several stream beds that originate near the rim of the Niagara Escarpment. Groundwater may lie near surface in some of the lower quarried areas. There are no down gradient groundwater users because the area to the south is serviced with a surface water supply. The shale weathers to a clayey consistency that may be suitable for cover material.

The site would likely require engineering to collect leachate and to protect surface water courses. Sanitary sewers are present in this area that may be capable of accepting leachate..

4.3.2 Canada Brick

Canada Brick operates a shale pit in an industrial subdivision located in the vicinity of Dundas Street and Appleby Line. The Queenston shale is mined at the site which covers an estimated area of 12 to 16 hectares, and is up to 15m deep on the west, north and south sides of the pit and zero meters deep on the east side where it opens onto Bronte Creek.

There are no surface water courses in the pit with the exception of a wash water pond in the southeast corner. The presence of Bronte Creek within the 100 meter setback for streams is a major constraint that would require careful engineering to collect leachate.

There are no significant groundwater flows from the shale nor are there any downgradient groundwater users.

Sewer services are either present or planned in the future. There is sufficient spoil and weathered shale debris to provide cover material for a waste disposal operation.

4.3.3 Nelson Quarry

The Nelson Aggregate Company operates a very large quarry in the Mount Nemo area. Dolostone of the Amabel formation is extracted and crushed at the site for a variety of construction uses. The site covers over 100 hectares and is 10 to 20 meters deep. Portions of the site have been finished.

There is no surface water egress from the pit, but it is anticipated that larger quantities of groundwater are intercepted and discharged. Engineering for the collection and treatment of leachate would have to be provided in order to protect groundwater quality. Cover material is limited in quantity.

4.3.4 Warren Paving, Springbank Sand & Gravel, David Lloyd George & Co.

The site comprises a large sand and gravel pit registered to several owners west of Rattlesnake Point. It covers an area several tens of hectares in size and is at least 20 meters deep. The sediments comprise partially cemented glacial outwash sands and gravels. Obtaining cover material for a waste disposal operation would not be problematic.

The site would have to be engineered to collect and treat leachate in order to protect groundwater users and nearby surface water resources.

4.3.5 Milton Limestone

Milton limestone is an active quarry in the Milton Heights area that extracts and crushes dolostone of the Amabel formation. The quarry covers an area of about 25 hectares and is estimated to be 30 meters deep. There is limited material available for cover.

There are no surface water courses nearby but groundwater would require protection as there are several groundwater users in the area.

4.3.6 RDB Building Products Ltd. (Milton Brick)

This area comprises a series of shale pits at the base of the Niagara Escarpment immediately to the south of the community of Milton Heights on Tremaine Road. The pits were used for brick material and were excavated into the Queenstone formation. They cover an area of 8 hectares and are up to 15 meters deep.

There are no significant groundwater resources in this area. Some of the pits contain ponds which likely indicate excavation below the water table. The pits are located near a tributary of Sixteen Mile Creek. It is anticipated that leachate controls would be required.

Cover material could likely be obtained from weathered shale and from the shale ridges between the pits.

4.3.7 Indusmin-Acton

The Indusmin quarry at Acton is an active dolomite quarry that presently covers an area of about 160 hectares and will be up to 25 meters deep. A further expansion of 120 hectares will be undertaken in the future. Some portions of the quarry have been completed. While there is little on-site cover material, borrow material from sand pits north of the site might be available for a disposal operation.

There are no surface water courses in the Quarry but Black Creek is situated to the north of the site. Extensive dewatering by gravity is undertaken to remove groundwater from the pit and undoubtedly a leachate collection and control system would be required if the site is used for waste disposal.

In the past, this quarry was considered as a potential site for the disposal of Metropolitan Toronto's waste by a rail-haul scheme and hence warrants some further more detailed consideration on whether it could play a role in Halton's Waste Management System.

4.3.8 Other Quarries

4.3.8.1 Indusmin Quarry - Milton

This dolomite quarry is in intermittent use but nearing completion. It is located northwest of the Town of Milton, covers an area of about 30 hectares and is up to 30 metres deep. There is little cover material available and the quarry abutts the maximum environmentally sensitive Hilton Falls Conservation Area. With the availability of other potential landfills in the Region, this site will receive no further consideration as a potential waste disposal site.

4.3.8.2 Dufferin Quarry - Milton

When completed, the Dufferin quarry northwest of Milton will cover an area of over 300 hectares and will be about 25 meters deep. Presently, the company plans to utilize a portion of the quarry floor for water storage and water control in the basin. This end use conflicts with waste disposal and consequently no further consideration will be given to this quarry.

SOURCES OF INFORMATION:

1983:
"Aggregate Resources Inventory of the Town of Halton Hills, Regional Municipality of Halton, Southern Ontario"; Ontario Geological Survey, Aggregate Resources Inventory Paper 46.

1982:
"Aggregate Resources Inventory of City of Burlington, Regional Municipality of Halton, Southern Ontario", Ontario Geological Survey, Aggregate Resources Inventory Paper 45.

1982:
"Aggregate Resources Inventory of Town of Milton, Regional Municipality of Halton, Southern Ontario"; Ontario Geological Survey, Aggregate Resources Inventory Paper 42.

1969:
Vos, M.A., "Stone Resources of the Niagara Escarpment", Ontario Department of Mines, Industrial Mineral Report 31.

1967:
Guillett, G.R., "The Clay Products Industry of Ontario", Ontario Department of Mines, Industrial Mineral Report 22.

SECTION 5 - BIOPHYSICAL ANALYSIS

At this initial screening level the objective was to map out significant biophysical features that may be adversely affected by placement and operation of a landfill. Because of the level of information required, the size of the Study Area (the Region), the timing, and costs, it was determined that at this stage of the study no new data would be acquired. Reliance would be placed on existing documentation. Extensive work has already been carried out by a variety of agents. The most complete documentation has been done by the Region of Halton in its Environmentally Sensitive Area Study. In addition to the Region, the Ministry of Natural Resources and the Conservation Authorities have undertaken biophysical investigations which have identified specific features which are of a significant and/or sensitive nature.

5.1 Evaluation Framework

Each of the areas indicated on Figure 1, support significant biological features. Each of the features in its own right is as sensitive and important as all others. However, in defining potential candidate areas, there must be an established framework for ranking biophysical features since certain "trade offs" may be required at the next level of detail. In this regard, it is necessary to a) explicitly define the biophysical features of each of the areas in a consistent manner; and, b) determine whether there is any "relative" significance among the biophysical features.

5.1.1 Definition of Biophysical Features

The Regional Municipality of Halton, in its document on the environmentally sensitive ares, presencs the selection criteria used, and the guidelines for the interpretation of these criteria. Since these selection criteria and the guidelines are well argued, and since the majority of the biophysical features indicated on the overlay map are E.S.A.'s, it was determined to use these selection criteria in defining the biophysical features. Theses criteria are presented in Table 1.

TABLE 1

SELECTION CRITERIA FOR ENVIRONMENTALLY SENSITIVE AREAS

Environmentally sensitive areas, as defined by the EEAC, are those land and water areas containing natural features or ecological functions of such significance as to warrant their protection in the best long-term interests of the people and environment of Halton Region. These areas are essential in maintaining a healthy ecological balance within the Region, and may also provide ancilliary benefits for scientific research, education, or recreation. Their protection is an integral part of the fulfillment of man's responsibility of stewardship of land and other living things.

These sensitive areas may or may not have been significantly affected by current or past human activity and they may or may not require some form of management to restore, maintain, or improve certain of their natural values. However, they all share the need for some degree of protection because of their vulnerability to destruction by man's activities.

Criteria for selecting these highly sensitive areas for definition in Regional Official Plans and local zoning by-laws include, but are not necessarily restricted to, any one or combination of the following:

1. The area represents a distinctive and unusual landform within the Region, Ontario or Canada.

2. The ecological function of the area contributes significantly to the healthy maintenance of a natural system beyond its boundaries by serving as a water storage, recharge, or discharge area, important wildlife migratory stopover or concentration point, or a linkage of suitable habitat between natural biological communities.

3. The plant and/or animal communities of the area are identified as unusually high quality within the Region, Ontario or Canada.

4. The area is a habitat with limited representation in the Region, Ontario or Canada, or a small remnant of particular habitats which have virtually disappeared within the Region.

5. The area has an unusually high diversity of biological communities and associated plants and animals due to a variety of geomorphological features, soils, water, sunlight and associated vegetation and microclimatic effects.

6. The area provides habitat for rare or endangered species that are endangered Regionally, Provincially, or Nationally.

7. The area is large, affording a habitat for species that require extensive blocks of suitable habitat.

8. The location of the area, combined with its natural features, make it particularly suitable for scientific research and conservation education purposes.

9. The combination of landforms and habitats is identified as having high aesthetic value in the context of the surrounding landscape.

(*Regional Municipality of Halton, 1978)

TABLE 2

CRITERIA FOR DESIGNATING ENVIRONMENTALLY SIGNIFICANT AREAS*	Region Criteria Number (see Table 1)
Areas Significant Because of Terrain Features	
1.1 The area represents a distinctive and or unusual landform within the watershed, municipality, Ontario or Canada.	1
1.2 The area serves a significant hydrologic function beyond its boundaries providing for groundwater discharge to a waterbody, flood storage and/or is a wooded area of high infiltration capacity.	2
Areas Significant Because of Biological Features	
2.0 The area contains species of flora or fauna which are:	
2.1 rare or endangered indigenous species which are endangered within the watershed, province or nation or,	6
2.2 of unusual and/or significant value within the watershed, municipality, province or nation.	1
3.0 The area is an ecosystem which:	
3.1 is a remnant of a particular ecosystem which has virtually disappeared from the watershed, municipality, province or nation or,	4
3.2 demonstrates unusually high diversity of species but none of which individually is considered as rare or unusual and/or is of significant value or,	5
3.3 provides habitat for rare or endangered species.	6
4.0 The area:	
4.1 is sufficiently large to afford habitat for species which require extensive blocks of suitable land or,	7
4.2 helps to maintain significant natural biological systems beyond its boundaries.	2
Areas Significant Because of Aesthetic Qualities	
5.1 The area because of its combination of landforms and biological features, as identified in the above criteria, has high aesthetic value in the context of the surrounding landscape.	9

(*Credit Valley Conservation Authority)

TABLE 3

SIGNIFICANT BIOPHYSICAL AREAS

BIOPHYSICAL AREA (see accompanying map)			POTENTIAL LEVEL OF IMPACT ON CERTAIN LANDS WITHIN DEFINED AREA (1)			
MAP SYMBOL (2)	AGENCIES DESIGNATIONS (If Applicable) (3)	NAME	UNACCEPTABLE	HIGH	MODERATE	LOW
R 1	ESA 1	Clappison Escarpment Woods	X			
R 2	ESA 2	Bridgeview Valley	X			
R 3	ESA 3	Grindstone Creek Valley	X			
R 4	ESA 4	Sassafras Woods	X			
R 5	ESA 5	Waterdown Escarpment Woods	X			
R 6	ESA 6	Nelson Escarpment Woods	X			
R 7	ESA 7, M 1	Lake Medad and Medad Valley	X			
R 8	ESA 8	Mount Nemo Escarpment Woods	X			
R 9	ESA 9	Lowville-Bronte Creek Escarpment Valley	X			
R 10	ESA 10, M 2	Bronte Creek Valley	X			
R 12	ESA 12	Fourteen Mile Creek Valley	X			
R 13	ESA 13	Iroquois Shoreline Woods	X			
R 14	ESA 14	Wildflower Woods	X			
R 15	ESA 15	Joshua Creek Valley	X			
R 16	ESA 16, M 3	Sixteen Mile Creek Valley	X			
R 17	ESA 17	Milton Heights	X			
R 18	ESA 18, M 4	Crawford Lake-Rattlesnake Point Escarpment Woods	X			
R 19	ESA 19	Calcium Pits	X			
R 20	ESA 20, M 5	Guelph Junction Woods	X			
R 21	ESA 21	Moffat Swamp	X			
R 22	ESA 22	Brookville Swamp	X			
R 23	ESA 23	Knatchbull Swamp	X			
R 24	ESA 24	Blue Springs Swamp	X			
R 25	ESA 25, M 6	Milton Falls Complex	X			
R 26	ESA 26, M 7	Blue Springs Creek Valley	X			
R 27	ESA 27, CPESA 13	Fairy Lake Marsh	X			
R 28	ESA 28, M 8	Acton Swamp	X			
R 29	ESA 29	Speyside Escarpment Woods	X			
R 30	ESA 30, CPESA 11	Waterfall Woods/(silver creek swamp)	X			
R 31	ESA 31, CESA 17	Limehouse Cliffs & Woods	X			
R 32	ESA 32, CESA 22	Silvercreek Valley	X			
R 33	ESA 33, CESA 21	Ballinafad Pond	X			
R 34	ESA 34, CPESA 17	Snow's Creek Woods	X			
R 35	ESA 35, CESA 23	Terra Cotta Woods	X			
R 36	ESA 36, CESA 19	Georgetown Credit River Valley	X			
R 37	ESA 37, CESA 20	Hungry Hollow Ravine	X			
R 38	ESA 38, CPESA 19	Ballinafrad Esker			X	
R 11	ESA 11	Bronte Burloak Woods		X		
(No designated symbol)	Halton Region Conservation Authority Defined Wetlands	-	X			
C 10	CESA 10	Stevenson Woods	X			
CP 10	CPESA 10	-			X	
CP 11	CPESA 11	Silver Creek Swamp	X			
CP 12	CPESA 12	-		X		
CP 14	CPESA 14	-	X			
CP 15	CPESA 15	-	X			
CP 16	CPESA 16	-	X			
CP 18	CPESA 18	Ballinafad Woods			X	
A 1	-	Silver Creek Valley			X	
A 2	-	Halton Hills Channel			X	
A 3	-	Scotch Block Reservoir			X	
A 4	-	Esquesing Conservation Area			X	
A 5	-	Burns and Shanahan Conservation Areas			X	
A 6	-	McKenzie Davis Tract			X	
A 7	-	Kelso Conservation Area			X	
A 8	-	Twiss Tract			X	
A 9	-	Crawford Tract			X	
A 10	-	Rattlesnake Point			X	
A 11	-	Mount Nemo Conservation Area			X	
A 12	-	Hager Rambo Diversion			X	
A 13	-	Morrison Wedgewood Division			X	
N 1	Significant Biological Area	-		X		
N 2	Spawning Nursery Area	-		X		

Notes:

(1) Areas adjacent to an "unacceptable" category area are rated high;
areas adjacent to a "high" category area are rated moderate;
areas adjacent to a "moderate" category area are rated "low". See text

(2) Only one symbol per area is shown on the map, regardless of how many designations an area has received.

(3) RESA = Regional Municipality of Halton designated Environmentally Sensitive Area

W = Wildlife habitat area as defined by The Ministry of Natural Resources

CESA = Credit Valley Conservation Authority designated Environmentally Significant Area

CPESA = Credit Valley Conservation Authority designated Potential Environmentally Significant Area

A = Conservation Authority lands, with boundaries as indicated on MNR Mapping

M = Ministry of Natural Resources-defined areas

The criteria used by the Credit Valley Conservation Authority in defining their Environmentally Significant Areas is very similar to the criteria established by the Region. Table 2 presents the Credit Valley Conservation Authority criteria.

The criteria used by the Region and by the Credit Valley Conservation Authority are not identical. However, there are broad similarities. It is possible to relate the criteria used by the Authority to those of the Region. On Table 2 a column has been added which show the relationship between the Region's criteria and the Authority's criteria. Consequently, it was possible to categorize the E.S.A.'s and P.E.S.A's as defined by the Authority in the same manner as the E.S.A.'s defined by the Region. Areas delineated by the Halton Region Conservation Authority and The Ministry of Natural Resources also were categorized using the criteria established by the Region.

5.1.2 Relative Significance of Biophysical Features

As stated previously, it may become necessary to trade off between two environmental areas when trying to define sites for landfilling. Although it is always difficult to compare or rate intangibles, a rating system for the Region's criteria has been developed. The rating is not meant to imply that an area defined by any specific criteria is not worthy of protection. It is only a guide for consideration if, at the site identification level it becomes necessary to trade off between, for instance, disrupting an area which provides habitat for rare or endangered species, or an area which is used for conservation education purposes.

When considering each criterion in determining the rating of that evaluation factor, the "absoluteness" and "permanence" of the environmental distruption was considered. For instance, the loss of a nationally rare plant is an absolute loss which can never be replaced, whereas the loss of one educational area usually can be compensated by the establishment of another. The rating system is comprised of four potential

levels of impact: 1. unacceptable; 2. high; 3. moderate; and, 4. low. Each of the nine criteria were individually considered (keeping in mind the "absoluteness" and "permanence" mentioned above) and placed in one of the four potential levels of impact. The result of these considerations is as follows:

1. Unacceptable - areas that exhibit either or both Criterion 2, or Criterion 6 (at the provincial or national level).

2. High - areas that exhibit one or more of Criteria 4, 5, 7, or 6 at the regional status level. In addition, areas adjacent to those areas classified as "unacceptable" would also receive a high rating.

3. Moderate - areas that have one or more of Criteria 1, 3, 8, or 9. In addition, areas adjacent to those areas classified as "high" would also receive a moderate rating.

4. Low - no "significant biophysical area" has been explicitly defined in the low category. However, areas adjacent to those areas classified as " moderate" would receive a low rating.

The buffer areas or setbacks have not been defined at this time, because each of the criteria may require a different setback. For example, if an area is classified unacceptable because of the presence of rare plants it would require a different buffer, or setback, than if the area was classified unacceptable because it supported a significant wetland community.

If a significant biophysical area is influenced by a candidate area then the exact buffer would be determined in consultation with the appropriate agencies, such as MNR, MOE and the Conservation Authorities.

5.2 Significant Biophysical Areas

The known significant biophysical areas within the Regional Municipality of Halton are shown on Figure 1. The boundaries obtained from public agencies were not consistent in some cases. It was decided that the most generous boundary would be appropriate to use at this stage.

Figure 1

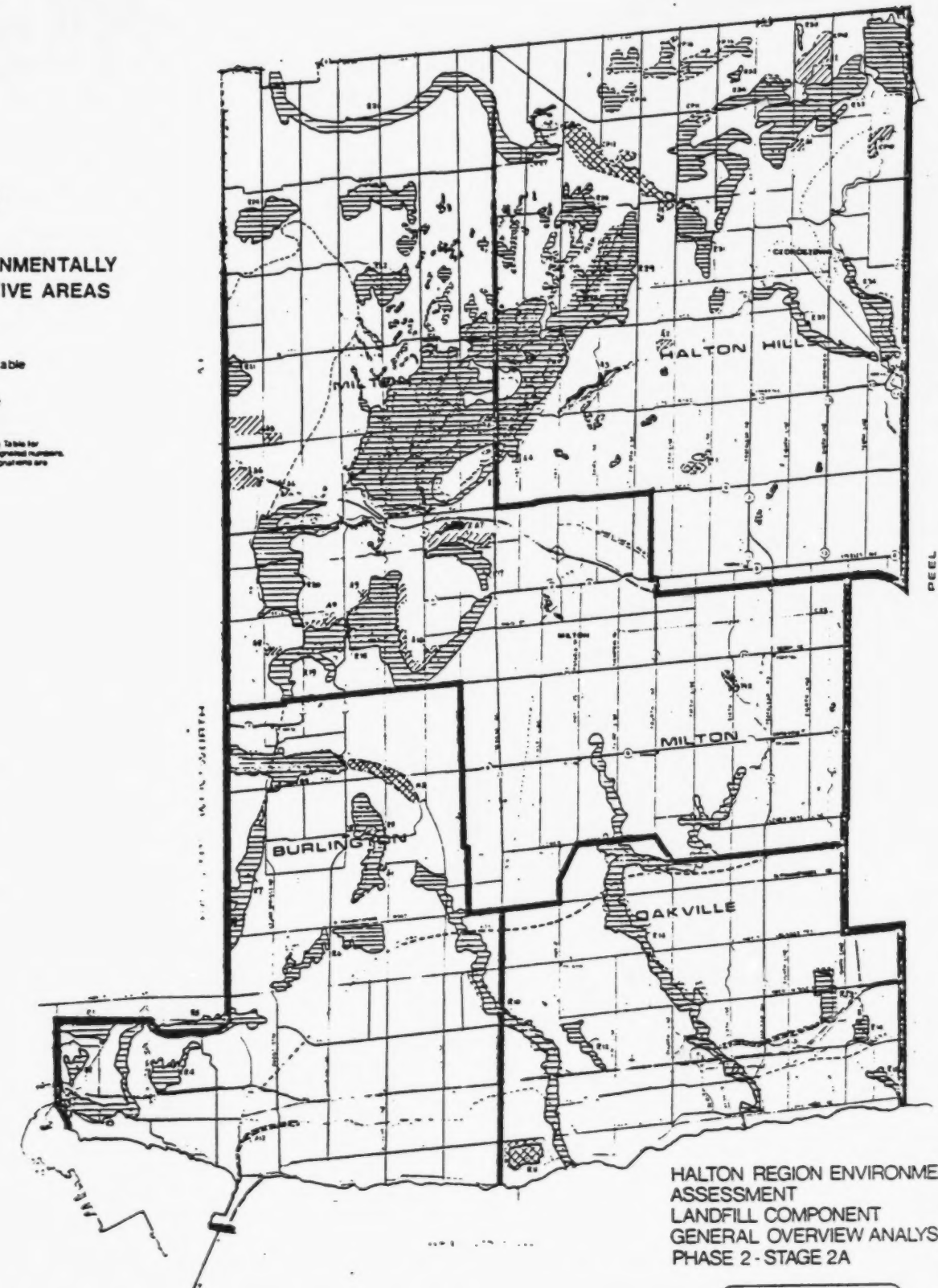
ENVIRONMENTALLY SENSITIVE AREAS

LEGEND

- Unacceptable
- High
- Moderate

Notes

See accompanying Table for explanation of designated numbers. Areas without designations are wetlands



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

Walker Wright Young Associates Limited / Planning Consultants
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Halton

In addition, the biophysical features which give a specific area its special status may only occupy portions of the mapped out area. Since it is not anticipated that these biophysical areas will be in the vicinity of a landfill site(s), it was felt that at this time further work should be spent in refining the boundaries.

As discussed above, the buffer areas have not yet been defined. When an actual boundary is established a suitable buffer would be determined in consultation with the appropriate agencies.

Table 3 lists the areas which have been indicated on figure 0. Each area on the map has been designated with a symbol, with the exception of the Wetlands defined by the Halton Region Conservation Authority. Thus, any area without a map symbol can be assumed to be a Wetland. It can be seen on Table 3 that some areas have more than one designation on them. However, only one symbol appears on the map. The boundary of each Agency's mapping is explicitly indicated. When the areas were catalogued in terms of their potential level of impact, the broadest boundary for an area, determined by amalgamating the various Agencies' boundaries, was used.

The potential level of impact on an area is indicated on figure 0 and shown on Table 3. It should be noted that in Table 3 a column heading is "Potential Level of Impact on Certain Lands Within Defined Area". This wording is a result of the difficulty associated with defining specific boundaries of these biophysical aras.

5.2.1 Areas R 1 to R 38

The primary definition of these areas is by the Regional Municipality of Halton, as environmentally sensitive areas. The Table also highlights the fact that both the Credit Valley Conservation Authority and the Ministry of Natural Resources have recognized some of these areas.

Table 4, taken from the Region's "Environmentally Sensitive Area Study", summarized the criteria fulfilled by each of these areas.

TABLE 4

ENVIRONMENTALLY SENSITIVE AREA'S CRITERIA SUMMARY*

ESA No.	Name of E.S.A.	Approx. Area-Hectares	ESA Criteria Fulfilled (by Criteria #)								
			1	2	3	4	5	6	7	8	9
1.	Clappison Escarpment Woods	40.5	X					X		X	X
2.	Bridgeview Valley	44.5				X		X			
3.	Grindstone Creek Valley	290	X	X			X	X			
4.	Sassafras Woods	99				X		X			
5.	Waterdown Escarpment Woods	138		X	X			X		X	X
6.	Nelson Escarpment Woods	91	X		X		X	X			
7.	Lake Medad and Medad Valley	229	X	X	X		X	X			
8.	Mount Nemo Escarpment Woods	215	X	X		X		X			X
9.	Lowville-Bronte Creek Escarpment Valley	350		X	X		X	X			X
10.	Bronte Creek Valley	526		X	X		X	X	X	X	X
11.	Bronte Burloak Woods	91		X	X		X	X			
12.	Fourteen Mile Creek Valley	44.5		X			X	X			
13.	Iroquois Shoreline Woods	73	X		X		X	X			X
14.	Wildflower Woods	30				X	X	X			
15.	Joshua Creek Valley	45	X		X	X	X	X			
16.	Sixteen Mile Creek Valley	973		X	X		X	X	X		
17.	Milton Heights	130	X	X							X
18.	Crawford Lake-Rattlesnake Point Escarpment Woods	593	X	X	X		X	X		X	X
19.	Calcium Pits	290	X				X	X		X	X
20.	Guelph Junction Woods	411		X		X	X	X	X		
21.	Moffat Swamp	138		X	X			X			
22.	Brookville Swamp	152		X				X			
23.	Knatchbull Swamp	243		X				X			
24.	Blue Springs Swamp	182		X	X			X			
25.	Hilton Falls Complex	2818	X	X	X	X	X	X	X		X
26.	Blue Springs Creek Valley	395		X	X			X			X
27.	Fairy Lake Marsh				X	X		X			
28.	Acton Swamp	144		X				X			
29.	Speyside Escarpment Woods	498	X	X	X		X	X	X		X
30.	Waterfall Woods	320	X					X			X
31.	Limehouse Cliffs & Woods	152	X		X	X		X			
32.	Silvercreek Valley	527	X	X			X	X	X		X
33.	Ballinafad Pond	16	X			X	X	X			
34.	Snow's Creek Woods	122		X			X	X			
35.	Terra Cotta Woods	304	X	X				X		X	
36.	Georgetown Credit River Valley	230		X	X		X	X		X	X
37.	Hungry Hollow Ravine	212			X		X	X			X
38.	Ballinafad Esker	26	X								

(*Regional Municipality of Halton, 1978)

R 11 is the area that was at one time designated as E.S.A. 1. This E.S.A. was deleted by Ministerial modification. However, to maintain consistency in the method used in this general overview analysis, the area has been mapped. This is because, at the level of information being used, it still meets some of the evaluation criteria. Inclusion of this area does not jeopardize the method since, if a landfill site(s) is proposed in the area, further work would be done to determine in detail the biophysical features present. If no biophysical features meeting the criteria are found, then the area would not influence the landfill siting.

5.2.2 Wetlands (no designated symbol)

These Wetlands have been mapped by the Halton Region Conservation Authority. The only available information on the Wetlands relates to their size. As yet, it is not known whether they are recharge or discharge areas, or whether they support rare plants, or act as important wildlife habitat in their area. However, it is probable that each Wetland will function in one of these ways, and therefore they have been categorized under the Region's Criterion No. 2.

5.2.3 Areas C 18, CP 10, 11,12, 14, 15, 16 and 18

These areas have been designated by the Credit Valley Conservation Authority, either as an environmentally significant area (C.E.S.A.), or as a potential environmentally significant area (C.P.E.S.A.).

Table 5 summarizes the criteria (Region) fulfilled by each area. The categorization is based on the relationship established in Table 2 (for the C.E.S.A.) and is limited (for the C.P.E.S.A.) by the amount of available information.

5.2.4 Areas A 1 to /A 13

These areas are Conservation Authority Land Holdings, as indicated on The Ministry of Natural Resources maps. There are no specific criteria

TABLE 5

ENVIRONMENTALLY SIGNIFICANT AREAS
AND POTENTIAL ENVIRONMENTALLY SIGNIFICANT AREAS*
CRITERIA SUMMARY

ESA No.	Name of E.S.A.	ESA Criteria Fulfilled (by Criteria #)								
		1	2	3	4	5	6	7	8	9
CESA 18	Stewarton Woods	X	X			X				
CPESA 10	Credit Valley, South of Terra Cotta			X						
CPESA 11	Silver Creek Swamp						X	X		X
CPESA 12	Black Creek at Acton					X				
CPESA 14	"Swamp"	X						X		
CPESA 15	"Swamp"	X						X		
CPESA 16	"Swamp"	X						X		
CPESA 18	Ballinafad Woods		X							

(*Credit Valley Conservation Authority)

for Authority Lands; however, they have been categorized using Criterion No. 8.

5.2.5 Areas M 1 and M 2

These areas refer to Ministry of Natural Resources defined areas, that have not been defined by any other agency. Since no information is available, beyond the fact that M 1 has been called a "significant biological area" and M 2 "spawning nursery areas" at this time it is difficult to pinpoint which criterion may apply. Criteria 4, 5, and 7 all may apply. Thus these criteria were used in categorizing M 1 and M2.

SECTION 6.0 LAND USE ANALYSIS

6.1 OFFICIAL PLAN FOR THE HALTON PLANNING AREA

The Halton Regional Plan was approved by the Minister of Housing on August 1, 1980, subject to modifications, referrals and deferrals to the Plan. Official Plan Amendment No. 1: The Waterfront Plan was subsequently approved by the Minister of Municipal Affairs and Housing on December 24, 1981, with modifications and deferrals. The current Regional Plan Consolidation, December 15, 1982, was used in the preparation of this review.

It should be noted that certain sections of the Regional Plan have been either referred or deferred. Therefore, clarification of such referrals or deferrals can be obtained by referring to the actual Regional Plan Consolidation.

The purpose of this section is to review the goals, objectives and policies in the Regional Plan Consolidation which apply to the site selection process for landfilling in Halton.

Regional Plan: Goals and Objectives

Excerpts from Part II, "Goals and Objectives" of the Regional Plan, are summarized below.

3A Growth and Settlement: To provide a variety of choice in terms of sizes and types of communities to maintain a high quality of the natural environment and to provide a form of growth that is consistent with the need to conserve energy resources.

3B Economic Development: To ensure diversification of the Region's economic base to support opportunities for the tourist industry, and to increase the provision of job opportunities in Halton.

3D Agriculture: To develop and maintain a permanently secure, economically viable agricultural industry as an important component of Halton's economic base, and as a source of employment for Halton's rural community. The preservation of prime agricultural soils is included in the set of objectives for Agriculture.

3E Environmental Protection: To protect signficant areas, to define hazard lands, to improve and maintain water quality in Lake Ontario, and to encourage early regulation of existing and potentially incompatible uses resulting from adverse environmental effects.

3G Forestry: To protect significant tree-covered areas, and to promote a "linked forest system" in the Region.

3H Mineral Resources: To ensure the production and provision of mineral resources to meet future needs and demands, consistent with regional goals, objectives and policies, and to develop guidelines for the staged rehabilitation and after-use potential of pits and quarries.

3I Open Space: To establish an integrated system of open space areas and corridors, and to preserve scenic views and routes and unique historic features.

3K Transportation: To provide a safe, convenient, efficient transportation system for all persons and goods, with a minimum disruption to the environment.

The effect of the Goals and Objectives on selecting potential areas for landfill is that significant emphasis is placed on the protection and preservation of natural resources such as agricultural land, mineral aggregate areas, forestry areas, and environmentally sensitive areas.

The conservation of energy resources is another intended goal stated of the Regional Plan. While it may seem that several of these Goals and

Objectives are incompatible with the selection of a landfill site(s), the Plan does incorporate policies for solid waste management which seek to recover viable materials from solid waste. In addition, Section D3.9 of the Regional Plan states:

> "Locate sanitary landfills where feasible on lands less suited to other purposes, but recognize the the nature of the operation of landfills, including the need to protect ground and surface water, may require locations for landfills which according to other policies of this Plan, may be best suited for other purposes".

6.2 Regional Plan: Growth Management and Resource Management Policies

The policies in The Regional Plan are essentially divided into two categories - Growth Management Policies and Resource Management Policies. Both types of policies should be considered in the site selection process in Halton. The designation of Regional policy areas has been used considerably in the evaluation factor regarding land use.

6.2.1 Growth Management Policies

Growth Management policies are associated with the "Regional Concept", Map 1 of the Regional Plan. This map indicates five "Regional Policy Areas", as follows:

- Urban Area
- Rural/Hamlets
- Waterfront Area
- Niagara Escarpment
- Parkway Belt

The intent of policies associated with each of the areas listed above is as follows:

REGIONAL POLICY AREA	PURPOSE
Urban Area:	Area of concentration for urban development, amenities and services. Area Municipalities are required to prescribe land uses and policies in conformity with the policies of the Regional Plan.[3]
Rural/Hamlets:	Control of development and preservation of character of Hamlets; the Rural Area includes extensions to the Parkway Belt proposed by the Region, and Niagara Scarp Protection and Complementary Use Areas.
Waterfront Area:	Amendment No. 1 establishes the development plan for the waterfront. The waterfront Area extends south of Lakeshore Road and North Shore Boulevard in the west part of Burlington.
Regional Extensions to the Parkway Belt:	These extensions are regional policy only and are identified for open space or urban limiter functions.
Scarp Protection and Complementary Use Areas	Regional designations to protect areas pending the completion of the Niagara Escarpment Commission's Plan.

6.2.2 Resource Management Policies

The Resource Management policies address the preservation of economically significant natural resources such as agriculture, forestry, mineral resources, energy; and the protection of property (Hazard Lands) and the conservation of man-made and natural amenities, including heritage resources, Environmentally Sensitive Areas and Open Space areas.

These policies are summarized below from Part IV of the Regional Plan:

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[3]The Urban Area boundaries shown on "The Regional Concept", Map 1 have been amended by Official Amendments 3 and 4 for the Acton and Georgetown Areas, and the Burlington Urban Area has been extended north of Highway 5 between Appleby Line and Walkers Line by Official Plan Amendment No. 7.

a) Agriculture

The Plan promotes the "recognition, encouragement and protection" of agriculture in the Region. Priorities with respect to agricultural land would be evaluated on the basis of soil capability, viability of farm size, and farm type. Severances would be controlled to ensure that viable farm units would be maintained. Farm Lands in the Rural Area are recognized as a long-term use, and Farm Lands in the Urban Areas as an interim use. The definition of Farm Lands used in the Plan is as follows: "FARM LANDS means, for the purposes of this Plan, only those lands which are evaluated as having a potential for farming due either to their containing Prime Agricultural Soils, or to their accommodating, or having accommodated, well-established farm uses."

b) Forestry

Policies in this section provide "recognition, encouragement and protection" of forestry, both as a land conservation practice and as an industry. Non-compatible developments are discouraged in woodlots and forests.

c) Mineral Resources

The most relevant policies to landfilling involve the reclamation of pits and quarries and the preservation of future mineral resource extraction areas. The Plan discourages uses which would be incompatible with extractive operations in Mineral Resource Protection Areas, Map 4, of the Regional Plan.

d) Energy

The Plan promotes the conservation of energy, including the implementation of resource recovery techniques and the use of recycled wastes as an energy resource. Energy conservation techniques would be applied to Regional activities as an example to the private sector.

e) Heritage

The heritage policies support the conservation of heritage features, including the formation of Local Architectural Conservation Advisory Committees (LACAC) in area municipalities. The City of Burlington, the Town of Oakville and Town of Milton have established LACA Committees. The Town of Halton Hills has not yet estabished a LACAC.

f) Hazard Lands

The designation of Hazard Lands, Map 5, in the Regional Plan, is based on Ministry of Natural Resources Hazard Lands mapping. Established Fill and Flood Line mapping, as approved by Conservation Authorities, is used to refine MNR mapping. It is possible for hazard designations to be lifted where certain conditions can be met.

g) Environmentally Sensitive Areas

Environmentally Sensitive Areas are identified on Map 6 of the Regional Plan. Development within an ESA would require the preparation of an acceptable Environmental Impact Assessment. An Environmental Assessment carried out under the terms of the Environmental Assessment Act would be acceptable.

h) Open Space

An interconnected regional open space system is to be established, based on Figure 7, "Regional Open Space Concept".

i) Summary

Most of the resource management policies above place some restrictions on the establishment of landfilling in areas specifically designated as resource management areas. However, for the General Overview Analysis, the evaluation factors used in the site screening process recognize the limitations produced by the foregoing policies and policy designations. In some cases, the Regional Plan designations and/or criteria have been incorporated directly into the evaluation factors and will be rated accordingly "unacceptable", "high", "moderate" or "low" impact.

6.3 Provincial Policies Affecting Halton Region

The major areas in Halton Region affected by provincial planning policies include the Parkway Belt Planning Area and the Niagara Escarpment Planning Area. The following brief summary of the provincial policies affecting Halton are extracts from the respective provincial plans.

6.3.1 The Parkway Belt West Plan: The Parkway Belt West Plan was approved by the Lieutenant Governor on July 19, 1978. The Plan is currently under review by the Ministry of Municipal Affairs and Housing, but details regarding specific issues to be addressed by the Review are not available.

The Parkway Belt West Planning Area comprises a series of 'links' and 'belts' extending between the City of Hamilton in the west, and the Town of Markham in the east. Within Halton Region, the Planning Area is divided into the following components:

- Escarpment Link
- Southern Link
- Northern Link
- Burlington - Oakville Mini-Belt
- Oakville - Mississauga Mini-Belt

The Parkway Belt West Plan forms part of the Regional Plan, and in cases of discrepancy between the two documents the Parkway Belt West Plan takes precedence. The goals of the Parkway Belt West Plan are as follows:

"2.1 Separate and define the boundaries of urban areas, thus helping to provide the residents with a sense of community identification.

2.2 Link urban areas with each other and with areas outside the region by providing space for the movement of people, goods, energy and information, without disrupting community integrity and function.

2.3 Provide a land reserve for future linear facilities and for unanticipated activities requiring sites of high accessibility and substantial land area.

2.4 Provide a system of open space and recreational facilities linked with each other, with nearby communities, and with other recreational areas."[2]

The land use designations in the Parkway Belt West Plan which apply in Halton Region are briefly summarized below.

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[2]Meeting with Mr. P. Isles and Mr. G. Donnelly, July 21, 1983.

Public Use Area: This Public Use Area description includes "Public Open Space" and the "Buffer Area". Permitted uses include existing and future corridors for transportation and utilities, and lands for electric power facilities. It is intended that most lands in the "Public Use Area" will be acquired by the Province or other agencies, either at the request of the landowner or, where required, at the initiation of the agency involved.

Complementary Use Area: This designation comprises mainly private uses which will be compatible with the provisions of the Plan. It includes the "General Complementary Use Area" and the "Special Complementary Use Area". There is an emphasis on low-density, low-intensity uses and preservation of natural featues, in both the "General Complementary Use Area" and the "Special Complementary Use Area".

The Halton Regional Plan includes one Regional extension to the "Public Use Area" of the Parkway Belt, and two extensions to the "Complementary Use Area".

6.3.2 Niagara Escarpment Planning Area

The Final Proposed Plan for the Niagara Escarpment Planning Area was submitted to the Provincial Secretary for Resources Development on June 30, 1983 and is subject to approval by the Lieutenant-Governor in Council.

The proposed Niagara Escarpment Plan consists of five land use designations in Halton Region, as shown in Table 6 following.

TABLE 6: Land Use Designation in the Proposed Niagara Escarpment Plan

Escarpment Natural Area:	- includes the most significant natural and scenic areas, stream valleys and wetlands. - permits mostly rural and non-intensive recreational uses, essential transportation and utility facilities, and single family dwellings. - limited expansion to small sandstone quarries permitted, (under 20,000 tonnes).
Escarpment Protection Area:	- visually prominent areas and areas of environmental significance. - includes modified environmental features due to agriculture or residential development. - includes buffer areas for Escarpment Natural Area, natural areas of Regional significance; - permits mostly rural and recreational uses, public institutional uses, transportation and utility facilities. - small wayside pits and limited expansion of small sandstone quarries.
Escarpment Rural Area:	- includes parts of the Escarpment, adjacent areas and buffers for ecologically sensitive areas. - intended to maintain open landscape, encourage agriculture and forestry, provide for designation of new Mineral Resource Areas; - permits mostly rural and recreational uses, including potential for residential development, small scale institutional uses, transportation and utility facilities, small scale commercial and industrial development.
Minor Urban Centre:	- identifies rural settlements, villages and hamlets; - intended to provide concentration points for development in rural areas; - growth would be in accordance with conforming Official Plans and secondary plans;

	- Minor Urban Centre designation applies to Lowville, Kilbride, Mount Nemo, Campbellville, Limehouse, and Silver Creek. These communities, with the exception of Limehouse and Silver Creek, are designated Hamlets in the Regional Plan.
Mineral Resource Area:	- includes existing and approved extraction areas. - permitted uses include licenced mineral extraction, operations, areas of recreational use and essential utility and transportation facilities. 'High Potential Mineral Aggregate Resources' are identified in Appendix Map 3 to the NEC Plan.

In addition to the above land use designations, there are several existing and proposed Escarpment parks in Halton. The parks in Halton are classified according to the Niagara Escarpment Park System, as follows:

Park Classification	Park Name
Escarpment Nature Reserve	. Silver Creek Conservation Area . Lake Medad Forestry Tract . Bronte Creek Valley . Tirion Tract
Escarpment Recreation Park	. Kelso Conservation Area
Escarpment Natural Environment Park	. Limehouse Conservation Area . Mount Nemo Conservation Area . Calcium Pits . Crawford Forestry Tract . Crawford Lake/Rattlesnake Point Conservation Areas . Hilton Falls Conservation Area . Stewart and Violet Bennett Scotsdale Farm . Terra Cotta Conservation Area
Escarpment Access	. Speyside . Esquesing and Escarpment Tracts

There are also six proposed parks in the Escarpment Link of the Parkway Belt West Plan. They are to be generally located south of Dundas Street (Highway 5) and west of Walker's Line and include:

- Appleby Creek
- Nelson Forest
- Cedar Springs Trail
- Nelson Cliffs (Nelson Quarry)
- Waterdown Woods
- Grindstone Creek

The public open space designation of the Escarpment Link in the Parkway Belt West Plan is part of the proposed NEC Parks System, and it is intended that the proposed park areas above, formally become part of the NEC Plan.[5]

The Niagara Escarpment Plan will be implemented by the Niagara Escarpment Commission in regulatory matters such as land use control. Non-regulatory functions of the Plan will be implemented by the Niagara Escarpment Trust.

6.3.3 Summary

The Niagara Escarpment Planning Area covers a significant area in Halton Region, and within the NEC Planning Area there are several significant Escarpment features, protected natural areas, and elements of the NEC Park System as identified in the previous section. The emphasis of the Proposed NEC Plan is clearly directed toward the preservation of the natural and scenic qualities of the Planning Area and avoidance of disruption of the natural characteristics through incompatible forms of development. Therefore, for the purposes of the General Overview Analysis, areas included in the NEC Planning Area will generally be considered as a

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[5]The Final Proposed Plan for the Niagara Escarpment, June, 1983. Page 32.

potential moderate impact for landfill. Due to "perceived" impact on the intent of the NEC Plan and the potential land use conflicts between the Escarpment features and landfills. Escarpment areas will be investigated in more detail at the site comparison stage, where appropriate.

6.4 Solid Waste Management Policies

The Regional Plan encourages the evaluation of alternative solid waste systems, and the acceptance of resource recovery techniques where feasible. This approach to solid waste management was confirmed by Regional Council in Stage 1 - Waste Needs and Systems Analysis with Council's decision to pursue a resource recovery based system, with one component being landfill.

Specific regional policies affecting the siting of landfill sites are as follows:

> "D3.7a Select landfill sites, if required, on the basis of comparative studies which will, among other things, examine the social, economic and environmental impact of each site, and take into consideration the views of affected citizens and any other matters as determined by Regional Council."

The use of land for landfill is regarded as an interim use, pending rehabilitation and an after-use for the landfill. The special locational requirements of landfill sites are recognized, and it is accepted that they would require a relatively flexible interpretation of Regional Plan policies with respect to the protection of other land uses;

> "D3.9 Locate sanitary landfills where feasible on lands less suited to other purposes, but recognize that the nature of the operation of landfills, including the need to protect ground and surface water, may require locations for landfills which according to other policies of this Plan may be best suited for other purposes." [underlining added]

6.5 Official Plans for Area Municipalities

The purpose of this section is to review the Official Plans of Area Municipalities in Halton, with respect to the implications for future land use in the Region and identification of potential land use conflicts for the General Overview Analysis. Each of the Area Municipalities forms a subsidiary Planning Area within the Halton Region Planning Area.

6.5.1 City of Burlington

Amendment No. 49

The City of Burlington Amendment No. 49 includes the policies for the Burlington Urban Area. It was approved by the Ontario Municipal Board on June 16, 1971. There is an Office Consolidation of the Official Plan dated January 1981 and, since that time, nine amendments (the latest to date is Amendment No. 116) have been proposed.

The Official Plan policies for the Rural Area, comprising most of the lands lying north of Highway 5, are set out in Amendment No. 81, which was amended by Amendment No. 101, approved by the Minister of Housing on August 26, 1980.

Prior to the Parkway Belt West Plan being in effect, the Burlington Urban Area extended to No. 1 Side Road. Once the Plan was approved, the Parkway Belt was incorporated into the Official Plan. This had the effect of excluding a significant area from the Urban Area, including the Parkway Belt.

The Parkway Belt Amendment excluded a remnant area lying north of Highway 5 and south of the proposed Highway No. 403. This area was included in the original Parkway Belt Planning Area but was not so designated. It is now proposed that this area, with the addition of adjacent lands to the east of Appleby Line, be designated as

'Development Area' and 'Industrial', within the Urban Area. Amendment No. 109 was adopted by the City of Burlington in August 1981 to this effect. A recent Amendment - No. 7 - to the Regional Plan was adopted by Regional Council on July 6, 1983, to redesignate the area from 'Rural' to 'Urban Area'.

The effect of the above amendments would be to include virtually all lands in the City of Burlington lying south of the Parkway Belt within the Urban Area. The urban boundaries adopted for purposes of the General Overview Analysis reflect the recent changes and amendments.

Amendment No. 49 designates lands intended for longer term development 'Development Areas'.

Present Medium and High Density Residential designations are, for the most part, in the existing built-up areas and do not represent major extensions to the Urban Area.

The Headon community, bounded by Upper Middle Road, Guelph Line, proposed Highway 403, Highway 5 and Walker's Line, is slated for low density residential development. Amendment No. 76 was approved by the Ontario Municipal Board on July 14, 1978, and comprises a Secondary Plan for the Headon Community.

The Plan incorporates two industrial designations with potential for substantial further development. The first is generally located to the east of Guelph Line between Upper Middle Road and Fairview Street, and is bisected by the Queen Elizabeth Way. Parts of this area are occupied by industrial and industrial/commercial development, or are the subject of industrial subdivision proposals.

The second major industrial designation comprises a roughly triangular area in the western part of the City, enclosed by a CNR line to the south, Highway 403 to the north, and an area of Parkway Belt land to

the east. Further industrial designations to the south and northeast of this area are substantially developed, but this particular area remains undeveloped.

Rural Area Policies

Land use policies for the mainly rural area of Burlington to the north of Dundas Street are provided by Official Plan Amendment #81, which was approved by the Minister of Housing in August, 1980. This Amendment designates lands as 'Settlement Area', 'Residential', 'Rural Residential', 'Agriculture', 'Natural Resources' and 'Extractive Industrial'.

The 'Settlement Areas' are located west of Walker's Line, and include the Regionally designated Hamlets of Kilbride, Lowville, Alfred Harris Gardens and Mount Nemo. All of the 'Settlement Areas' are located within or adjacent to the Niagara Escarpment Plan Area.

The 'Residential' and 'Rural Residential' designations both provide for the development of low density single family housing--again, all of these areas are located west of Walker's Line.

There are three areas designated 'Extractive Industrial', which make provision for sand and gravel and quarrying operations, and which protect lands for this purpose.

The most extensive single designation in the Amendment is 'Agriculture', which is intended to 'encourage the orderly preservation of rural lands and to keep the agricultural use sound'.

6.5.2 Town of Halton Hills

The Official Plan for the Halton Hills Planning Area was adopted by Council in October, 1982, and has not received Ministerial approval to date. This Plan supersedes Official Plans for four municipalities which had jurisdiction over areas prior to the formation of the Town of Halton Hills.

The Halton Hills Plan designates two "Urban Areas", containing the communities of Acton and Georgetown. The boundaries of the Urban Areas are modified from the those shown in the Regional Plan, which would be amended to provide for the proposed urban area boundaries through Amendments Nos. 3 (Acton) and 4 (Georgetown) to the Regional Plan.[6]

In addition to the two Urban Areas, the Planning Area contains lands in the Parkway Belt West Planning Area and the Niagara Escarpment Planning Area.

For the purpose of the General Overview Analysis, the lands within the Acton and Georgetown Urban Areas as described above will be considered as areas of 'planned urban development'. There are, however, additional areas of vacant land within the Urban Area boundaries which will be included within the category of undeveloped urban land.

The Plan provides separate land use designations within the "Urban Areas", "Rural Cluster Areas" and the "Rural Industrial Area". The Official Plan designates nine of the eleven Existing Rural Clusters identified in the Halton Region Rural Cluster Study. In addition, four of the seven Potential Rural Clusters are designated in the Plan. All designated "Rural Cluster Areas" are as follows:

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[6]Regional Official Plan Amendment No. 3 approved by Regional Council August, 1982; Amendment No. 4 approved by Regional Council January, 1983.

Ashgrove	Speyside
Balinafad	Terra Cotta
Crewson's Corner	Halton/Peel Townline
Hornby	Highway 7/Fourth Line
Limehouse	Highway 25/No. 17 Sideroad
Mansewood	Highway 7/No. 22 Sideroad
Silvercreek	Steeles Avenue/Ninth Line

"Rural Industrial Areas" as designated in the Plan are restricted to the southern part of the Planning Area, and are intended to accommodate industrial uses which do not require urban services. The lands included within this designation are vacant at the present time.

The "Rural Area" is intended primarily for agricultural use, although other uses which would not conflict with this use are permitted.

6.5.3 Town of Milton

The Official Plan of the (former) Milton Planning Area was approved by the Ontario Municipal Board in June 1970. In October 1977, Council adopted a new Official Plan which has not received Ministerial approval. As the 1977 proposed Plan covers the current Milton Planning Area, it will form the subject of the following review.

The boundary of the Milton "Urban Area" is almost identical with that designated in the Regional Plan, with two minor deviations. Lands lying south of Steeles Avenue within the "Urban Area" are substantially developed, whereas lands north of Steeles Avenue are vacant or contain more recent development. The bulk of the undeveloped land is designated 'Industrial'.

The "Development Area" will include the Milton "Urban Area", the designated "Hamlet Settlement Areas", and selected estate residential locations to be considered on individual merits in the Rural Areas.

Hamlet Settlement Areas are the same as those designated in the Regional Plan, including Moffatt, Brookville, Campbellville and Milton Heights. As the area municipality Plan pre-dates the Regional Plan, no specific consideration is given to Rural Clusters.

With the exception of lands under the jurisdiction of the Parkway Belt Plan and the Niagara Escarpment Plan, the designations outside the urban areas are as follows:

"Conservation"	- Hazard Lands
Agriculture	- forestry and other low intensity uses including rural residential
Rural	- agriculture, forestry, other low intensity uses including estate residential
Extractive Industrial	- quarrying and related uses

No specific reference is made to landfill facilities or to their locational criteria. However, approval for a regional landfill site on Part of Lots 6 and 7, Concession 7, was obtained by the Region of Halton and the Town of Milton was ordered to enact an appropriate zoning by-law amendment and Official Plan Amendment, to permit the regional landfill site.[7]

6.5.4 Town of Oakville

The Official Plan for the Town of Oakville is Amendment No. 52 to the Official Plan, which has been approved by the Ministry of Housing. However, a new Official Plan was approved by Council in June 1983.

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[5]Supreme Court of Ontario Court of Appeal, Brooke, Blair, and Robins, J.A., April, 1983.

(a) Approved Plan, 1980

The "Basic Land Use Proposals', Figure E of the 1980 Plan include the "Urban Area, and a designated "Urban Envelope" which forms the basis of proposed urban development areas. All future urban development is to be phased according to the target areas shown in the Plan. The area covered by the "Urban Area", the "Urban Envelope" and associated urban designations is broadly comparable with the Regional "Urban Area".

The Regionally designated "Extension to the Parkway Belt" is shown as "Urban Envelope" (Phase 2) in the 1980 Plan, which does not conform to the Regional Plan.

Land use designations outside the "Urban Area" include:

- "Tourist and Industrial Area (Special Study Area)" near the intersection of Highways 5 and 25;
- "Open Space" and "Hazard" designations associated with Sixteen Mile Creek;
- "Agricultural Lands";
- "Sanitary Landfill Site"

The "Sanitary Landfill Site" designation applies to the former Oakville landfill which was closed in December 1982. The Plan states that the sanitary landfill site is to be permitted as an interim use for the operational life of the site. The operation of the landfill will cease following its closure. No amendment to the Plan will be necessary to permit public open space and recreational use, once landfilling is no longer permitted.

The Plan contains no designated Hamlets, and no special provision is made for the two Regionally identified 'Potential Rural Clusters' of Burnhamthorpe Road/Trafalgar Road and Burnhamthorpe Road/Highway 25.

(b) Adopted Plan, 1983

The revised plan provides some similarities and some changes to the 1980 Plan. The proposed "Urban Area", "The Regional Concept", Figure B, has been modified to include the "Regional Extension to the Parkway Belt". Some adjustments have been made to the phasing of development of undeveloped lands in the "Urban Area". The northern limit of the "Urban Area" remains approximately along Dundas Street (Highway No. 5).

It is proposed that the "Industrial-Tourist Special Study Area" will be enlarged to cover the northwestern quadrant of Highway 5/Highway 25 intersection between the Parkway Belt and Tremaine Road. The Study Area lies entirely outside the "Urban Area" in the Regional Plan. Consideration of future development in the Study Area would include industrial and commercial designations in relationship with Palermo and with future land uses to the west of Burloak Drive in the City of Burlington.

Provisions with respect to the "Sanitary Landfill Site" designation are similar to those in the 1980 Approved Plan.

6.6 Evaluation Process

This section describes the process used to identify the different impact categories by the Land Use factor, A.7. The levels of impact used in the evaluation of the factor are as follows:

Compatibility with Existing and Planned Land Use	Rating
Within or adjacent to existing built-up areas and/or existing Hamlets or Rural Cluster	Unacceptable
Within or adjacent to planned Urban Areas and planned Rural Clusters	High
Within 1.6 km of these designated areas	Moderate
More than 1.6 km from these designated areas	Low

The limits of the existing and planned settlement areas shown on Figure 2 were established from secondary sources, including the Regional Plan, Area Municipalities Official Plans, and amendments thereto.

6.6.1 Built-Up Urban Areas

Boundaries for the exisiting built-up urban areas were identified from land use maps from the City of Burlington, Town of Halton Hills and Town of Oakville and are shown on Figure 2. Land use maps were not available from the Town of Milton and, consequently, a 1:50,000 topographic map and combination of the Official Plan for the Milton Planning Area were used to determine the existing urban area boundaries.

6.6.2 Hamlets

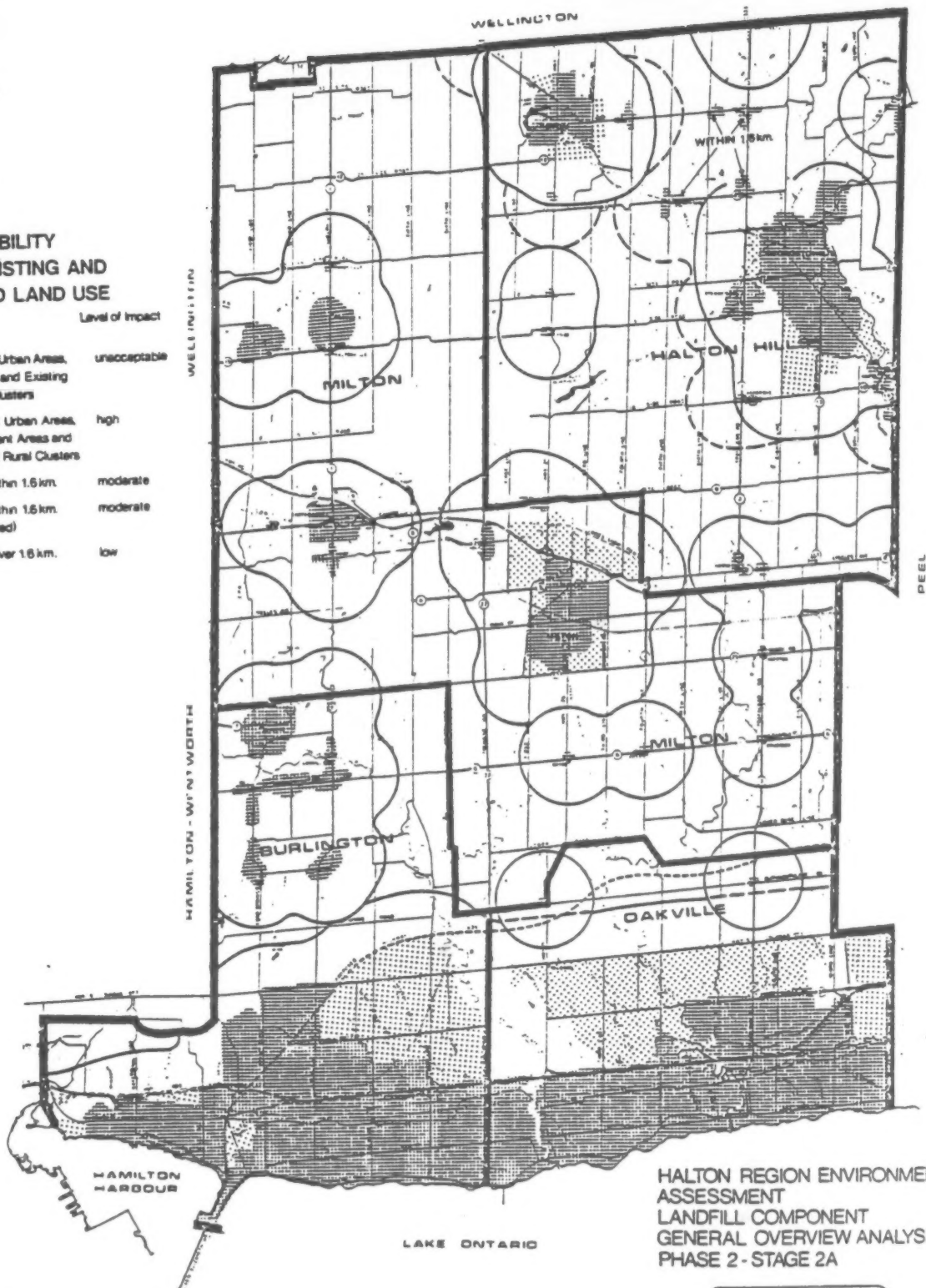
The "Regional Concept" Map 1, in the Regional Plan was used as a guide in identifying the location of the Hamlets. However, in order to determine more specific boundaries for these areas, the respective Official Plans and amendments thereto were used.

Figure 2

COMPATIBILITY WITH EXISTING AND PLANNED LAND USE

LEGEND

	Level of Impact
Built-up Urban Areas, Hamlets and Existing Rural Clusters	unacceptable
Planned Urban Areas, Settlement Areas and Planned Rural Clusters	high
Area within 1.6 km.	moderate
Area within 1.6 km. (Extended)	moderate
Area Over 1.6 km.	low



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

Walker Wright Young Associates Limited / Planning Consultants
15 Steele Avenue Toronto Ontario M4V 1S8 416 968-3511

Halton

6.5.3 Rural Clusters

The Halton Region "Rural Cluster Study" (1982) was used to identify boundaries for all of the existing and potential Rurual Clusters. To ensure consistency across the Region, all Rural Clusters identified in the Rural Cluster study are shown on figure .

6.6.4 Planned Urban Areas

Boundaries for Planned Urban Areas were taken from the "Regional Concept", Map 1 of the Regional Plan. However, three Amendments to the Regional Plan have been adopted by Regional Council and should be taken into consideration:

- Amendment #3: Acton Urban Area;
- Amendment #4: Georgetown Urban Area; and
- Amendment #7: Burlington Urban Area.

Consequently, the urban area boundaries shown on Figure 2 includes these modifications.

SECTION 7 - SOCIAL AND CULTURAL ANALYSIS

Mapping was for the following social factors:

- o population density
- o regional and community facilities

The population density factor is based on persons per square kilometre, and is rated as follows:

Population Density	Impact
400 persons/square kilometre or greater	Unacceptable
200-399 persons/square kilometre	High
100-199 persons/square kilometer	Moderate
Less than 100 persons/square kilometer	Low

Population was based on 1981 Census Enumeration Area data.

The major urban areas can be automatically rated in the "unacceptable"category and, therefore, excluded from further consideration. Significant bands of the "low" impact category ar found in the vicinity of Highway 25 between Perry Road and Dundas Street (Highway 5) and in the eastern half of Milton below Highway 401; the northwest section of the Town of Milton. Several areas have a population density of less than 40 persons per kilometre outside the urban areas. It should be noted that the mapping of population density does not take into account the likeilhood that the population in these areas may be clustered in small discrete Hamlets. However, Hamlet aras and Rural Clusters in the Region ar included in Section 6.

The population density data is useful to identify the broad areas which could present greater or lesser problems for siting a landfill site or sites based on the number of people that could be affected. Taken together with figure 2, population density does help to priorize areas.

The significant regional facilities identified on a separate overlay map have some unique locational characteristics, such as the Niagara Escarpment Parks (Section 6), the Bruce Trail, and a wide range of community facilities which have regional or local significance. The latter would be placed in the "low" and "moderate" impact categories, from the Evaluation Factors Report, August, 1983.

It should be noted that the mapping of features and facilities does not allow any judgement to be made as to their intensity of use nor their significance to the local community or the Region as a whole. This type of more detailed analysis would be carried out in subsequent stages of the site selection process through direct consultation with groups in affected areas.

SECTION 8 - TRANSPORTATION ANALYSIS

8.1 Methodology

The transportation impact of locating a landfill site in a particular area is related directly to the resultant change in haulage routes throughout the Region. In order to assess these changes, the Region was divided in 30 zones (Figure 3). Each zone is a waste generator and a potential candidate area for the location of a landfill site. The area municipalities were divided as follows:

- Burlington - 9 zones (1-9),
- Oakville - 9 zones (10-18),
- Milton - 6 zones (19-24),
- Halton Hills - 6 zones (25-30).

Waste generation statistics for each zone (section 9) were used to calculate the centroid of waste for each of the four area municipalities. This was done for 1986 and 2001. It was found that the centroid of waste for each municipality did not shift significantly between these years and, for the purpose of the general overview assessment each municipal centroid was fixed at one location.

From each of these centroids, haulage routes were developed to each zone using the most likely route of travel; therefore, to each zone, four haulage routes were identified, one from each municipality. Travel times and distances along each route were calculated.

Potential impacts were assessed for each zone by determining how appropriate the identified haulage routes were for landfill-related traffic. Impacts were categorized as unacceptable, high, moderate or low. No zones were considered as unacceptable for a landfill site(s) based on the transportation factor.

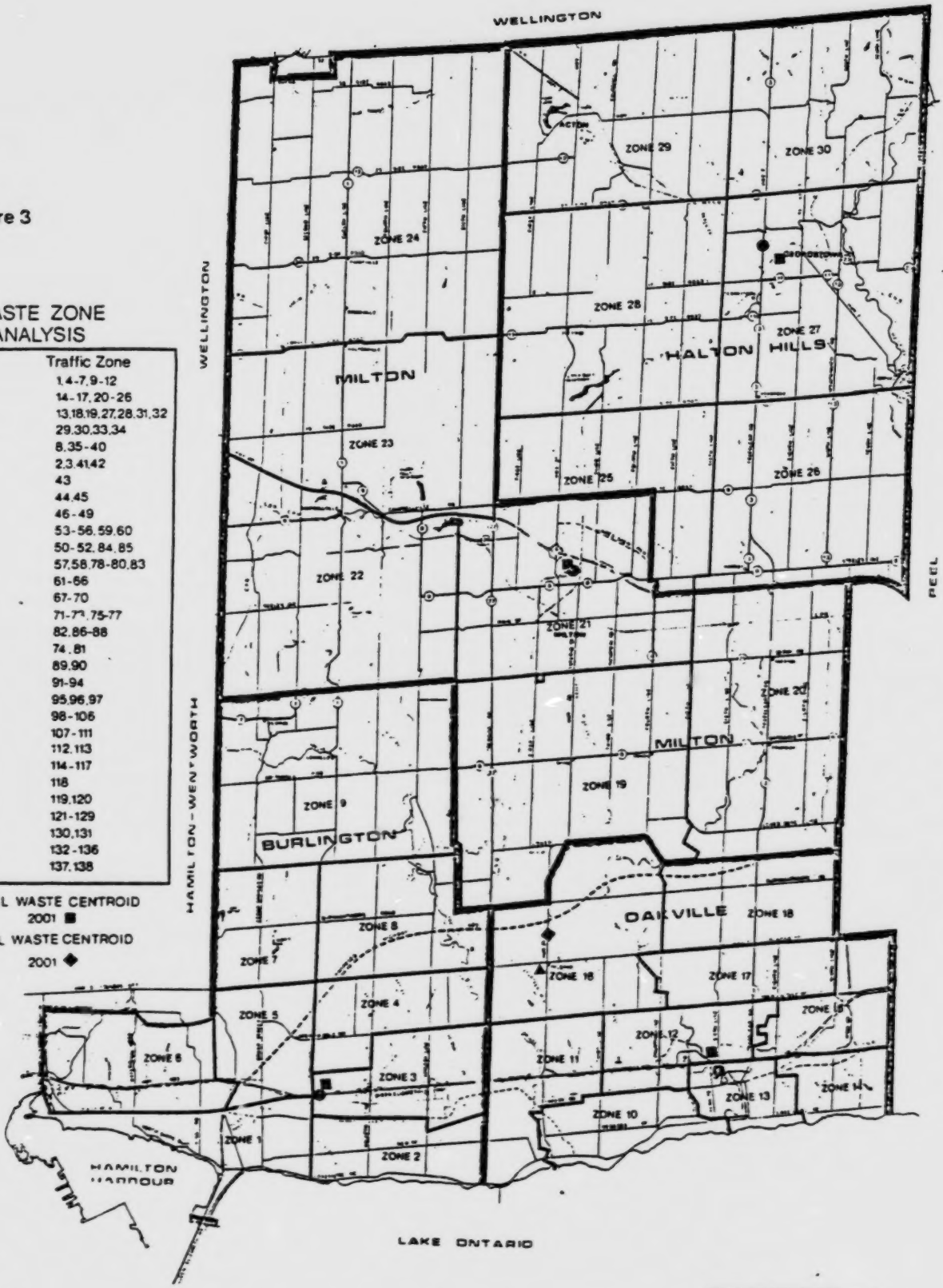
Figure 3

WASTE ZONE ANALYSIS

Zone	Traffic Zone
1.	1,4-7,9-12
2.	14-17,20-26
3.	13,18,19,27,28,31,32
4	29,30,33,34
5	8,35-40
6	2,3,41,42
7.	43
8	44,45
9	46-49
10.	53-56,59,60
11.	50-52,84,85
12	57,58,78-80,83
13	61-66
14	67-70
15	71-73,75-77
16.	82,86-88
17	74,81
18	89,90
19	91-94
20.	95,96,97
21	98-106
22.	107-111
23	112,113
24	114-117
25.	118
26.	119,120
27.	121-129
28	130,131
29	132-136
30.	137,138

MUNICIPAL WASTE CENTROID
1986 ● 2001 ■

REGIONAL WASTE CENTROID
1986 ▲ 2001 ◆



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8.2 Development of Zones

As indicated previously, the Region was divided into thirty zones to enable a more accurate development of haulage routes. These zones were developed using the following general criteria:

- land use should be reasonable consitent,
- shape should be relatively uniform,
- boundaries should be coincident with the smaller planning areas for which Regional population and employment projections are available;
- if possible, a major road (highway/Regional Road) should traverse the zone approximately in the middle.

With these general criteria, waste quantities could be developed for each zone based on population/employment data. In addition each zone could be represented by a point on the Region's road system approximately at the centre of the zone. Haulage routes were terminated at these zone centres.

8.3 Candidate Zones for Landfill

The following zones were considered unacceptable for landfilling due to strong incompatibility of landfill with the zone's existing and proposed land use:

- o Burlington - Zones 1, 2, 4 and 5
- o Oakville - Zones 10, 11, 12, 13, 14, 15 and 17

All remaining zones were assessed for their potential transportation impacts.

8.4 Zone Characteristics

For each zone, a primary haulage route (existing road network) from each of the four municipal centroids to the zone centre was identified. Each route is

considered to be the most likely location for haulage. Optional routes do, of course, exist. The primary haulage routes are considered to be the best (least overall impact) of all the route options between the municipal centroid and the zone centre.

Trip distances were calculated along each of the haulage routes. Travel times were determined based on the following assumptions of average travel speed for haulage vehicles;

- major provincial highways - 78 km/h,
- provincial highways - 62 km/h,
- regional roads - 46 km/h,
- local roads in urban areas - 24 km/h.

Tables 7 to 25 contain the following information for each zone:

- location of zone caentree (termination of haukahge route),
- zone population (1986 and 2001),
- zone employment (1986 and 2001),
- description of the primary haulage route from each of the four municipal centroids to the zone centre,
- trip distances,
- trip times.

8.5 Future Highway Network

The completion of the Highway 403 system through the Region and the construction of Highway 407 will create major haulage route options in the future. Each zone was tested for its sensitivity to these proposed facilities and, where appropriate, revised travel times and distances were calculated. These are summarized on Table 26 along with times and distances based on the existing network.

Portions of Highway 403 (from QEW to Highway 5 in Burlington,from Trafalgar Road to existing Highway 403 in Oakville) and Highway 407 in Halton Region are currently on MTC's 5 year construction program. The remainder of Highway 403 is on the Ministry's 10 year program. Although these programs are subject to revision, it is likely that both future highways will be completed in the Region by the year 2001.

8.6 Impact Assessment

In general, zones athat are well serviced by provincial highways and primary and secondary arterials were considered to have less potential tranportation impacts. These road types are more suited to landfill related traffic due to:

- operating conditions (travelling speed, geometry, conflicats with local traffic, etc.),
- nature of control of adjacent land uses,
- traffic volumes.

The following conditions were used to categorize potential transportation impacts for each zone:

A. The zone is not adequately serviced for landfilling activities by provincial highways.

B. The zone is not adequately serviced for landfilling activities by primary or secondary arterials.

C. Local terrain, road conditions and adjacent land use along local roads are not suitable for road upgrading to arterial standards.

D. Disruption of local traffic would result with the introduction of haulage vehicles on area roads.

E. Potential vehicle-pedestrian conflicts could exist.

The impacts are summarized in Table 27.

TABLE 7

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 3

LOCATION OF ZONE CENTRE: On North Service Road between Walkers Line and Appleby Line (Burlington)

ZONE POPULATION (1986/2001): 30/475

ZONE EMPLOYMENT (1986/2001): 23,004/33,244

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- North Service Road westerly	3.3	5
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Appleby Line; w. on North Service Road.	12.0	11
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario St.; s. on Ontario/Hwy.25 to QEW; w. on QEW to Appleby Line; w. on North Service Road.	25.1	32
HALTON HILLS	- s. on Trafalgar Road to QEW; w. on QEW to Appleby Line; w. on North Service Road.	40.9	47

* Existing road network

TABLE 8

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 6

LOCATION OF ZONE CENTRE: On North Service Road at Waterdown Road (Burlington)

ZONE POPULATION (1986/2001): 3,945/4,168

ZONE EMPLOYMENT (1986/2001): 2,510/2,930

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- w. on North Service Road/Plains Road to Brant Street; n. on Brant Street to North Service Road; w. on North Service Road to Waterdown Road.	7.2	9
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Plains Road exit; w. on ramp/Plains Road to Brant Street; n. on Brant Street to North Service Road; w. on North Service Road to Waterdown Road.	21.8	22
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25 to QEW; w. on QEW to Plains Road exit; refer to Oakville (above) for remainder.	34.9	43
HALTON HILLS	- s. on Trafalgar Road to QEW; w. on QEW to Plains Road exit; refer to Oakville (above) for remainder.	50.8	58

* Existing road network

TABLE 9

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 7

LOCATION OF ZONE CENTRE: On Cedar Springs Road at No.1 Side Road (Burlington)

ZONE POPULATION (1986/2001): 628/1423

ZONE EMPLOYMENT (1986/2001): 137/155

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- n. on Guelph Line to No.1 Side Road; w. on No.1 Side Road.	8.0	11
OAKVILLE	- w. on South Service Road to QEW/ Dorval interchange; w. on QEW to Plains Road exit; w. on ramp/ Plains Road to Brant Street; n. on Brant Street.	22.8	23
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25 to Hwy.5; w. on Hwy.5 to Cedar Springs Road; n. on Cedar Springs Road.	28.0	36
HALTON HILLS	- s. on Trafalgar Road to Hwy.5; w. on Hwy.5 to Cedar Springs Road; n. on Cedar Springs Road.	44.1	52

* Existing road network

TABLE 10

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 8

LOCATION OF ZONE CENTRE: On Walkers Line at No.1 Side Road (Burlington)

ZONE POPULATION (1986/2001): 731/1,389

ZONE EMPLOYMENT (1986/2001): 225/240

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- e. on North Service Road to Walkers Line; n. on Walkers Line.	8.2	11
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Walkers Line; n. on Walkers Line.	19.2	19
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25 to Hwy.5; w. on Hwy.5 to Walkers Line; n. on Walkers Line.	23.8	32
HALTON HILLS	- s. on Trafalgar Road to Hwy.5; w. on Hwy.5 to Walkers Line; n. on Walkers Line.	40.1	50

* Existing road network

TABLE E1

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 9

LOCATION OF ZONE CENTRE: On Guelph Line at Britannia Road (Burlington)

ZONE POPULATION (1986/2001): 2,918/3,447

ZONE EMPLOYMENT (1986/2001): 338/341

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- n. on Guelph Line to Britannia Rd.	11.4	15
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Guelph Line; n. on Guelph Line.	26.4	27
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25 to Derry Road; w. on Derry Road to Guelph Line; s. on Guelph Line.	18.9	28
HALTON HILLS	- s. on Trafalgar Road to Derry Rd.; w. on Derry Road to Guelph Line; s. on Guelph Line.	32.6	42

* Existing road network

TABLE 12

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 16

LOCATION OF ZONE CENTRE: On Highway 5 east of Highway 25 (Oakville)

ZONE POPULATION (1986/2001): 457/816

ZONE EMPLOYMENT (1986/2001): 56/758

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25 to Hwy.5; e. on Hwy.5.	14.1	12
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Highway 25; n. on Hwy.25 to Highway 5; e. on Highway 5.	12.1	11
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Highway 25 to Highway 5; e. on Highway 5.	16.9	24
HALTON HILLS	- s. on Trafalgar Road to Highway 5; w. on Highway 5.	30.2	37

* Existing road network

TABLE 13

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 18

LOCATION OF ZONE CENTRE: On Trafalgar Road South of Burnhamthorpe Road (Oakville)

ZONE POPULATION (1986/2001): 301/295

ZONE EMPLOYMENT (1986/2001): 35/56

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Trafalgar Road; n. on Trafalgar Road.	20.5	19
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road.	8.4	10
MILTON	- e. on Highway 401 to Trafalgar Rd.; s. on Trafalgar Road.	19.7	21
HALTON HILLS	- s. on Trafalgar Road.	22.7	30

* Existing road network

TABLE 14

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 19

LOCATION OF ZONE CENTRE: On Highway 25 at Britannia Road (Milton)

ZONE POPULATION (1986/2001): 1,178/1,289

ZONE EMPLOYMENT (1986/2001): 391/599

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25.	20.1	18
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Hwy.25; n. on Hwy.25.	18.7	18
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25.	8.2	16
HALTON HILLS	- s. on Trafalgar Road to Derry Rd.; w. on Derry Rd. to Hwy.25; s. on Hwy.25.	23.8	30

* Existing road network

TABLE 15

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 20

LOCATION OF ZONE CENTRE: On Trafalgar Road at Britannia Road (Milton)

ZONE POPULATION (1986/2001): 989/1,008

ZONE EMPLOYMENT (1986/2001): 143/143

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Trafalgar Road; n. on Trafalgar Road.	27.5	28
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road.	15.4	19
MILTON	- s. on Hwy. 25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario to Derry Road; e. on Derry Road to Trafalgar; s. on Trafalgar Road.	15.1	26
HALTON HILLS	- s. on Trafalgar Road.	16.9	22

* Existing road network

TABLE 14

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 19

LOCATION OF ZONE CENTRE: On Highway 25 at Britannia Road (Milton)

ZONE POPULATION (1986/2001): 1,178/1,289

ZONE EMPLOYMENT (1986/2001): 391/599

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25.	20.1	18
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Hwy.25; n. on Hwy.25.	18.7	18
MILTON	- s. on Hwy.25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street; s. on Ontario/Hwy.25.	8.2	16
HALTON HILLS	- s. on Trafalgar Road to Derry Rd.; w. on Derry Rd. to Hwy.25; s. on Hwy.25.	23.8	30

* Existing road network

TABLE 16

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 21

LOCATION OF ZONE CENTRE: On Highway 25 at Steeles Avenue (Milton)

ZONE POPULATION (1986/2001): 22,598/24,767

ZONE EMPLOYMENT (1986/2001): 8,915/12,633

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Highway 25; n. on Hwy.25/ Ontario Street.	26.4	29
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Highway 25; n. on Hwy.25/ Ontario Street.	24.4	28
MILTON	- s. on Highway 25 to Steeles Avenue; e. on Steeles Avenue to Ontario Street.	1.9	5
HALTON HILLS	- s. on Trafalgar Road to Steeles Avenue; w. on Steeles Avenue to Ontario Street.	17.7	23

* Existing road network

TABLE 17

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 22

LOCATION OF ZONE CENTRE: On Steeles Avenue at Guelph Line (Milton)

ZONE POPULATION (1986/2001): 2,199/2,598

ZONE EMPLOYMENT (1986/2001): 579/881

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- n. on Guelph Line.	18.2	24
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Hwy.25; n. on Hwy.25 to Derry Road; w. on Derry Road to Guelph Line; n. on Guelph Line.	33.0	35
MILTON	- w. on Hwy.401 to Guelph Line; s. on Guelph Line.	12.4	17
HALTON HILLS	- s. on Trafalgar Road to Hwy.401; w. on Highway 401 to Guelph Line; s. on Guelph Line.	31.8	33

* Existing road network

TABLE 18

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 23

LOCATION OF ZONE CENTRE: On Guelph Line at No.10 Side Road (Milton)

ZONE POPULATION (1986/2001): 1,056/1,484

ZONE EMPLOYMENT (1986/2001): 199/222

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- n. on Guelph Line.	24.7	32
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Hwy.25; n. on Hwy.25 to Derry Road; w. on Derry Road to Guelph Line; n. on Guelph Line.	39.3	44
MILTON	- w. on Hwy.401 to Guelph Line; n. on Guelph Line.	10.7	10
HALTON HILLS	- s. on Trafalgar Road to Hwy.401; w. on Highway 401 to Guelph Line; n. on Guelph Line.	19.4	25

* Existing road network

TABLE 19

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 24

LOCATION OF ZONE CENTRE: On Guelph Line between 20 Side Road and 25 (Milton)

ZONE POPULATION (1986/2001): 2,586/3,663

ZONE EMPLOYMENT (1986/2001): 281/325

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- n. on Guelph Line.	29.2	38
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; w. on QEW to Highway 25; n. on Hwy.25 to Derry Road; w. on Derry Road to Guelph Line; n. on Guelph Line.	44.0	50
MILTON	- w. on Hwy.401 to Guelph Line; n. on Guelph Line.	15.4	16
HALTON HILLS	- s. on Trafalgar to Side Road 15; w. on Side Road 15 to Guelph Line; n. on Guelph Line.	17.9	23

* Existing road network

TABLE 20

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 25

LOCATION OF ZONE CENTRE: On fourth Line between Side Road 5 and Side Road 10 (Halton Hills)

ZONE POPULATION (1986/2001): 914/994

ZONE EMPLOYMENT (1986/2001): 141/141

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25 to Derry Road; e. on Derry Road to Thompson Road; n. on Thompson Rd. to Steeles Avenue; e. on Steeles Avenue to Fourth Line; n. on Fourth Line.	32.8	34
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Side Road 5; w. on Side Road 5 to Fourth Line; n. on Fourth Line.	30.4	39
MILTON	- n. on Highway 25 to Side Road 5; e. on Side Road 5 to Fourth Line; n. on Fourth Line.	6.1	7
HALTON HILLS	- s. on Trafalgar Road to Side Road 10; w. on Side Road 10 to Fourth Line; s. on Fourth Line.	10.0	13

* Existing road network

TABLE 21

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 26

LOCATION OF ZONE CENTRE: On Regional Road 13 at Side Road 5 (Halton Hills)

ZONE POPULATION (1986/2001): 1,535/194

ZONE EMPLOYMENT (1986/2001): 1,569/194

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25 to Derry Road; e. on Derry Rd. to Trafalgar Road; n. on Trafalgar Road to Steeles Avenue; e. on Steeles Avenue to Ninth Line; n. on Ninth Line.	38.2	41
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Steeles Avenue; e. on Steeles Avenue to Ninth Line; n. on Ninth Line.	26.6	34
MILTON	- n. on Hwy. 25 to Side Road 5; e. on Side Road 5.	11.6	15
HALTON HILLS	- s. on Trafalgar Road to Side Road 5; e. on Side Road 5.	10.3	14

* Existing road network

TABLE 22

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 27

LOCATION OF ZONE CENTRE: Highway 7 at Mountainview Road (Halton Hills)

ZONE POPULATION (1986/2001): 25,076/37,618

ZONE EMPLOYMENT (1986/2001): 8,534/14,522

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Side Road 10; e. on Side Road 10 to Mountainview Road; n. on Mountainview Rd.	54.3	53
OAKVILLE	- w. on South Service Road to QEW/Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Side Road 10; e. on Side Road 10 to Mountainview Road; n. on Mountainview Rd.	34.3	45
MILTON	- e. on Hwy.401 to Trafalgar Road; n. on Trafalgar Road to Side Road 10; e. on Side Road 10 to Mountainview Road; n. on Mountainview Road.	21.3	23
HALTON HILLS	- e. on Regional Road 11 to Hwy.7; s/e on Highway 7.	3.0	8

* Existing road network

TABLE 23

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 28

LOCATION OF ZONE CENTRE: North of Side Road 15 at Third Line (Halton Hills)

ZONE POPULATION (1986/2001): 1,272/1,519

ZONE EMPLOYMENT (1986/2001): 242/245

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25/ Ontario Street to Steeles Avenue; w. on Steeles Avenue to Hwy.25; n. on Hwy.25 to Side Road 15; e. on Side Road 15 to Third Line; n. on Third Line.	38.6	43
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Side Road 15; w. on Side Road 15 to Third Line; n. on Third Line.	37.1	47
MILTON	- n. on Hwy.25 to Side Road 15; e. on Side Road 15 to Third Line; n. on Third Line.	10.3	11
HALTON HILLS	- s. on Trafalgar Road to Side Road 15; w. on Side Road 15 to Third Line; n. on Third Line.	7.4	10

* Existing road network

TABLE 24

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 29

LOCATION OF ZONE CENTRE: On Highway 25 at Highway 7 (Halton Hills)

ZONE POPULATION (1986/2001): 9,957/11,628

ZONE EMPLOYMENT (1986/2001): 2,791/3,221

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25/ Ontario Street to Steeles Avenue; w. on Steeles Avenue to Hwy.25; n. on Hwy.25.	44.3	47
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road to Highway 7; n. on Highway 7.	45.3	54
MILTON	- n. on Hwy.25.	16.0	16
HALTON HILLS	- n. on Trafalgar Road to Highway 7; n/w. on Highway 7.	13.0	13

* Existing road network

TABLE 25

GENERAL OVERVIEW ANALYSIS

ZONE CHARACTERISTICS FOR TRANSPORTATION IMPACT ASSESSMENT

ZONE NUMBER: 30

LOCATION OF ZONE CENTRE: Halton Hills Side Road 27 east of Trafalgar Road

ZONE POPULATION (1986/2001): 1,548/1,777

ZONE EMPLOYMENT (1986/2001): 351/382

FROM	PRIMARY HAUL ROUTE TO ZONE CENTRE*	TRIP DISTANCE (km)	TRIP TIME (minutes)
BURLINGTON	- s. on Guelph Line to QEW; e. on QEW to Hwy.25; n. on Hwy.25 to Derry Road; e. on Derry Road to Trafalgar Road; n. on Trafalgar Road/Highway 7 to Side Road 27; e. on Side Road 27.	51.6	55
OAKVILLE	- w. on South Service Road to QEW/ Dorval Drive interchange; e. on QEW to Trafalgar Road; n. on Trafalgar Road/Highway 7 to Side Road 27; e. on Side Road 27.	40.0	50
MILTON	- n. on Trafalgar Road/Highway 7 to Side Road 27; e. on Side Road 27.	24.9	25
HALTON HILLS	- n. on Trafalgar Road/Highway 7 to Side Road 27; w. on Side Road 27.	7.7	9

* Existing road network

TABLE 26

GENERAL OVERVIEW ANALYSIS - TRAVEL DATA (*)

	FROM BURLINGTON		FROM OAKVILLE		FROM MILTON		FROM HALTON HILLS	
TO (ZONE)	TRIP DIST.	TRIP TIME	TRIP DIST.	TRIP TIME	TRIP DIST.	TRIP TIME	TRIP DIST.	TRIP TIME
3	3.3 km	5 min.	12.0 km	11 min.	25.1 km (24.8 km)	32 min. (33 min.)	40.9 km (45.4 km)	47 min. (41 min.)
6	7.2 km	9 min.	21.8 km	22 min.	34.9 km (34.6 km)	43 min. (43 min.)	50.8 km (46.3 km)	58 min. (52 min.)
7	8.0 km	11 min.	22.8 km	23 min.	28.0 km (25.1 km)	36 min. (32 min.)	44.1 km (44.7 km)	52 min. (41 min.)
8	8.2 km	11 min.	19.2 km	19 min.	23.8 km (20.9 km)	32 min. (28 min.)	40.1 km (40.7 km)	50 min. (39 min.)
9	11.4 km	15 min.	26.4 km	27 min.	18.9 km	28 min.	32.6 km	42 min.
16	14.1 km	12 min.	12.1 km	11 min.	16.9 km	24 min.	30.2 km	37 min.
8	20.5 km	19 min.	8.4 km	10 min.	19.7 km	21 min.	22.7 km (27.5 km)	30 min. (28 min.)
19	20.1 km (19.2 km)	18 min. (17 min.)	18.7 km	18 min.	8.2 km	16 min.	23.8 km	30 min.
.0	27.5 km (25.4 km)	28 min. (23 min.)	15.4 km (20.1 km)	19 min. (18 min.)	15.1 km	26 min.	16.9 km	22 min.
21	26.4 km (25.5 km)	29 min. (28 min.)	24.4 km	28 min.	1.9 km	5 min.	17.7 km	23 min.
.2	18.2 km	24 min.	33.0 km	35 min.	12.4 km	17 min.	31.8 km	33 min.
23	24.7 km	32 min.	39.3 km	44 min.	10.7 km	10 min.	19.4 km	25 min.
24	29.2 km	38 min.	44.0 km	50 min.	15.4 km	16 min.	17.9 km	23 min.
25	32.8 km (31.9 km)	34 min. (33 min.)	30.4 km	39 min.	6.1 km	7 min.	10.0 km	13 min.
26	38.2 km (37.6 km)	41 min. (32 min.)	26.6 km (27.0 km)	34 min. (23 min.)	11.6 km	15 min.	10.3 km	14 min.
27	54.3 km (44.2 km)	53 min. (43 min.)	34.3 km (33.6 km)	45 min. (34 min.)	21.3 km	23 min.	3.0 km	8 min.
3	38.6 km (37.7 km)	43 min. (42 min.)	37.1 km (41.8 km)	47 min. (46 min.)	10.3 km	11 min.	7.4 km	10 min.
29	44.3 km (43.4 km)	47 min. (47 min.)	45.3 km	54 min.	16.0 km	16 min.	13.0 km	13 min.
30	51.6 km (50.7 km)	55 min. (54 min.)	40.0 km	50 min.	24.9 km	25 min.	7.7 km	9 min.

(*) EXISTING ROAD NETWORK; ONE WAY TRIP (NO WAIT OR MANOEUVRING TIME).

FIGURES IN BRACKETS ARE WITH HIGHWAYS 403 AND 407 IN NETWORK.

PM:sgr

TABLE 27

GENERAL OVERVIEW ANALYSIS

Impact Assessment - Transportation

Evaluation Factor: Traffic Service and Safety

Zone	Impact	Notes
3	Low	- maximum use of highways for haulage
6	Low	- some urban conflict potential in Burlington (Plains Road/Brant Street)
7	Moderate	- access for haulage vehicles within Zone 7 on local roads (potential conflicts)
8	Low	- major access via Walkers Line from highway system
9	Moderate	- location of zone results in increasing haulage lengths not on highways
16	Low	- maximum use of highways for haulage
18	Low	- maximum use of highways for haulage
19	Low	- maximum use of highways for haulage
20	Low	- major access via Trafalgar Road and Derry Road from highway system
21	Low	- some urban conflict potential in Milton
22	High	- considerable off highway travel for Burlington and Oakville - Guelph Line is only N-S Regional Road; not considered suitable for major haulage route
23	High	- see Zone 22 Note
24	High	- see Zone 22 Note
25	Moderate	- not well serviced by highways
26	Moderate	- not well serviced by highways - future construction of Highways 407 and 403 will improve access considerable from the south
27	Moderate	- see Zone 26 Note
28	Moderate	- not well serviced by highways
29	Moderate	- not well serviced by highways
30	Moderate	- not well serviced by highways

PM:lb,ht/ 8:80

SECTION 9 - ECONOMIC ANALYSIS

9.1 Land Cost

The purchase price of land is one of two economic factors which are relevant to the identification and evaluation of potential areas for landfill in Halton Region at this stage. Broad selling price averages have been researched to provide an indication of anticipated per hectare purchase price for the new landfill site.

The level of impact categories for the land cost factor, as set out in the report "Final Evaluation Factors: Phase 2, Stage A: General Overview Analysis" are as follows:

Unacceptable	---
High	Above $50,00/ha (app. $20,000/acre)
Moderate	$10,000 - $50,000/ha (app. $4,000 - $20,000/acre)
Low	Below $10,000/ha (app. $4,,000/acre)

The "unacceptable" category is not employed in the evaluation of land costs (or haul costs discussed subsequently) since its level is very difficult to define and indeed, may not even be applicable. The economic factors of themselves would not rule out candidate areas at this stage.

9.1.1 Evaluation Proccess

The sources of information for land costs were as follows:

- Mr. D.V. Geraght, Property Manager, Region of Halton -
- Mr. T. James, Ministry of Revenue, Peel-Halton Assessment Office
- A.E. Lepage, "Industrial Property Mart"

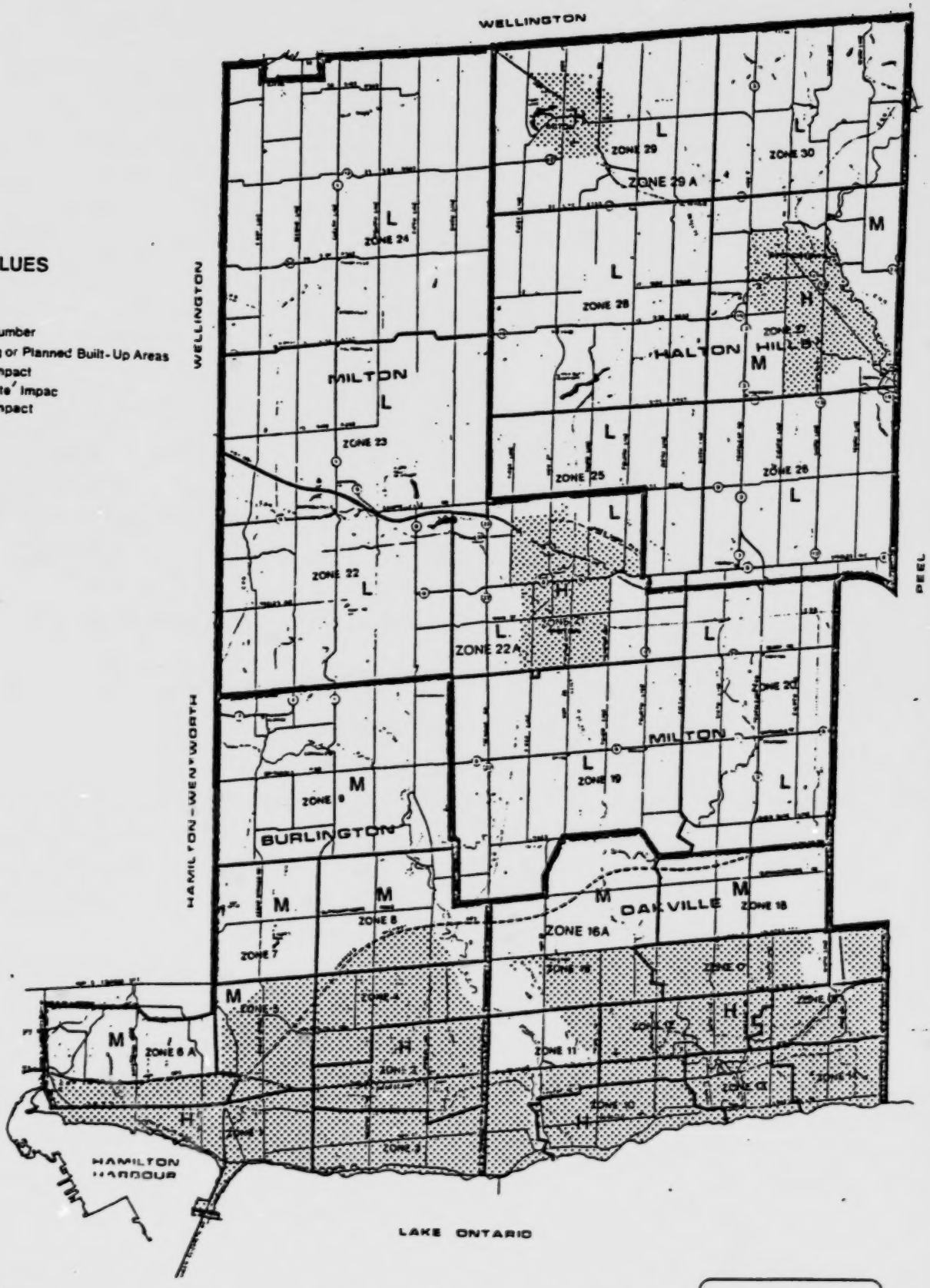
Although there were additional sources of information available, the data collected did not produce any significant disparities in terms of the level of impact categories defined. No further research was necessary.

Figure 4

LAND VALUES

LEGEND

- 7 Zone Number
- Existing or Planned Built-Up Areas
- H 'High' Impact
- M 'Moderate' Impac
- L 'Low' Impact



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15 Dallas Avenue Toronto Ontario M4V 1S8 416/968-2511

Halton

The rural area of Halton Region was divided into zones similar to those employed in the haul cost analysis discussed in 9.2. Some boundary modifications occurred as a result of land value differentiations in certain areas. The same numbers have been used in each case; since more zones were used in the haul costs analysis, the numbers do not run consecutively. In zones with boundary modifications the letter "A" has been added to the zone numbers. The land cost zones are shown on Figure 4. In addition, the existing and planned urban development areas in the Region were defined in accordance with the evaluation of the land use factor.

The estimated average land price per hectare for the zones in the rural areas of Halton are shown on Table 28. The level of impact based on the categories defined above is also included on Table 28 and on Figure 4. All data is in 1982 dollars and represents a best estimate of selling prices; in some cases, figures were provided in ranges and the mid-point has been used on Table 28.

Although these figures provide an estimate of the purchase price of land in the various zones, land prices mah be sensitive to the future use (if known by the seller) and degree of choice of location for the buyer. In the case of Halton's new landfill site(s), there will be no alternative locations and in all likelihood, extensive public awareness. As a result, it should not be assumed that the Region could purchase site(s) for landfill at the estimate prices shown on Table 28. Nevertheless, these figures do provide a relative indication of price differentials throughout the Region and are adequate for this stage in the analysis. The existing and planned Urban Areas have been assigned a "high"level of impact on Table 28. This was based on the average selling price for serviced industrial lands in each municipality since these would be the most likely potential candidate areas for landfill within existing and committed development areas. In any event, residential and commercial land prices would be even higher. The range of estimated 1982 selling prices for serviced industrial land for each municipality in Halton is as follows:

TABLE 28

ECONOMIC FACTORS

Evaluation of the Land Cost Factor

Municipality	Zone	1982 Estimated Average Land Value/Hectare $	Level of Impact
Burlington	6A	19,800	Moderate
	7	9,[illegible]0 - 19,800	Moderate
	8	9,900 - 19,800	Moderate
	9	9,900 - 12,400	Moderate
	Urban Area		High [3]
Oakville	16A	12,400 - 19,800	Moderate
	18	12,400 - 19,800	Moderate
	Urban Area		High [3]
Milton	19	8,000 - 8,600	Low
	20A	8,000 - 8,600	Low
	22A	7,400 - 8,600	Low
	23	4,700 - 6,200	Low
	24	4,700 - 6,200	Low
	Urban Area		High [3]
Halton Hills	25	8,600 - 9,900	Low
	26	8,600 - 9,900	Low
	27A	12,400[1]-32,100[2]	Moderate
	28	6,200 - 9,900	Low
	29A	4,000 - 6,800	Low
	30	4,000 - 6,800	Low
	Urban Area		High [3]

1. Excludes area to the east of Eighth Line with higher land values(along Highway 7, east of Georgetown).

2. Includes area to the east of Eighth Line.

3. High rating for urban areas based on price of serviced industrial land from A.E. Lepage Industrial Property Mart (1982 date) and Halton Region Property Manager.

SOURCE: Compiled by C.N. Watson and Associates Ltd., based on information from V. Geraghty, Region of Halton Property Manager and T. James, Ministry of Revenue, Peel-Halton Assessment Office.

Burlington	$55,000 - $120,000
Oakville	$55,000 - $120,000
Milton	$45,000 - $ 70,000
Georgetown	$40,000 - $ 60,000

9.2 Haul Costs

The second economic factor employed in this genral overview stage is the cost of hauling waste from each municipality to potential areas of landfill within various sectors of Halton Region. This evaluation factor represents an on-going expenditure for the Region unlike land costs, which are one time costs; thus, it has added significance.

The haul cost analysis draws on informationfrom the "Stage 1: Waste Needs and Systems Analysis" report (pages124 to 129 and 142 to 145) and represents a further refinement appropriate to this general overview stage. The Stage 1 report dealt with the cost of transporting waste (expressed in 1982 dollars per ton) from each municipality's 1982 waste centroid to four hypothetical landfill sites distributed geographically throughout the Region. In this analysis, the haul costs from the four municipalities' 1986 and 2001 waste centroids to 19 zones outside of the existing and planned built-up areas of the Region were used. Further refinements of the haul cost analysis will occur in the next stage when potential candidatae sites have been selected.

The level of impact categories for the haul cost factor, as set out in the report "Final Evaluation Factors: Phase 2, StageA: General Overview Analysis" are as follows:

Unacceptable	-
High	$13.00 - $19.00/tonne
Moderate	8.00 - 13.00/tonne
Low	2.00 - 8.00/tonne

These ranges are based on the haul costs developed for the municipalities in Tables 22 to 25 (pages 142 to 145) of the Stage 1 report. (Note that they have been converted to metric tonnes). Similar to the land cost factor, the

"unacceptable" category has not been employed in the evaluation of haul costs for the reason cited previously.

9.2.1 Population and Employment Projections

Population and employment projections were provided by the Region of Halton Planninag and Development Department by traffic zone in five year intervals from 1986 to 2001. In each case, a high and low forecast was provided.

The control totals for population in each municipality were established for the Stage 1 Waste Needs and Systems Analysis report and are set out on Table 15 (page 35) of that document.

To simplify the analysis, the mid-pointof the population and employment projection range has been employed in each case. The 1986 to 2001 figures for the Halton municipalities are shown on Table 29. The mid-points of the population and employment forecasts for the traffic zones were aggregated into the 30 zones from the waste zone analysis (Section 8). The data for 1986 to 2001 is shown on Tables 30 and 31, along with the waste forecasts.

9.2.2 Waste Projections by Zone

The 1986 and 2001 waste projections for Halton Region developed in the Stage 1 report were disaggregated into the 30 zones. The purpose was to develop more accurate municipal waste centroids for these years based on the changing pattern of growth for the Region. Each zone figure is not intended to be a precise forecast since at this stage of the analysis, the relative magnitude of the figures is the major concern.

The mid-point of the 1986 and 2001 waste forecast prepared for the Stage 1 analysis as shown on Table 28 (page 152) of the report provided the control totals for the development of the zonal waste projections as follows:

Table 29

Halton Region Population and Employment Forecasts: 1986 and 2001

	1986			2001		
	Low	Mid-Point[1]	High	Low	Mid-Point[1]	High
Population						
Burlington	117,501	128,259	138,995	134,498	152,257	169,997
Oakville	84,100	90,058	96,000	109,202	125,110	141,001
Milton	29,201	30,606	31,999	32,602	34,809	36,999
Halton Hills	38,502	40,302	42,100	48,702	55,105	61,501
Total Region	269,304	289,225	309,094	325,004	367,281	409,498
Employment						
Burlington	42,405	46,308	50,193	53,198	60,258	67,298
Oakville	35,401	37,908	40,400	47,499	54,403	61,302
Milton	10,001	10,508	11,002	13,906	14,803	15,705
Halton Hills	11,702	12,253	12,802	16,504	18,705	18,705
Total Region	99,509	106,977	114,397	131,107	148,169	163,010

1. Mid-points were calculated on the basis of totalling the traffic zone mid-point figures. Consequently, they vary slightly from the mid-point of the low and high projections for the total municipality.

Source: Halton Region Planning and Development Department

Table 30

Projected Waste Generation by Zone 2001

Mun.	Zone	Population	Residential Waste Generation (tonnes)	Employment	Non-Residential Waste Generation (tonnes)	Total Waste (tonnes)
Burl.	1	39,942	14,219	14,435	13,145	27,364
	2	45,653	16,252	3,068	2,794	19,046
	3	475	169	33,244	30,274	30,443
	4	22,123	7,875	1,600	1,457	9,332
	5	33,637	11,975	4,245	3,866	15,841
	6	4,168	1,484	2,930	2,668	4,152
	7	1,423	507	155	141	648
	8	1,389	495	240	219	714
	9	3,447	1,227	341	310	1,537
	Total	152,257	54,203	60,258	54,874	109,077
Oak.	10	26,460	9,420	4,358	6,097	15,517
	11	8,358	2,975	7,36C	10,308	13,283
	12	26,923	9,585	12,164	17,017	26,602
	13	13,843	4,928	10,413	14,567	19,495
	14	9,080	3,232	2,200	3,078	6,310
	15	10,537	3,751	13,363	18,694	22,445
	16	816	290	758	1,060	1,350
	17	28,798	10,252	3,739	5,231	15,483
	18	295	105	40	56	161
	Total	125,110	44,538	54,403	76,108	120,646
Mil.	19	1,289	459	599	212	671
	20	1,008	359	143	51	410
	21	24,767	8,817	12,633	4,469	13,286
	22	2,598	925	881	312	1,237
	23	1,484	528	222	78	606
	24	3,663	1,304	325	115	1,419
	Total	34,809	12,392	14,803	5,237	17,629

cont'd..

Table 30 cont'd.

Mun.	Zone	Population	Residential Waste Generation (tonnes)	Employment	Non-Residential Waste Generation (tonnes)	Total Waste (tonnes)
Halton Hills	25	994	354	141	64	418
	26	1,569	559	194	88	647
	27	37,618	13,392	14,522	6,580	19,972
	28	1,519	541	245	111	652
	29	11,628	4,140	3,221	1,460	5,600
	30	1,777	633	382	173	806
	Total	55,105	19,619	18,705	8,476	28,095
TOTAL REGION		367,281	130,752	148,169	144,695	275,447

Sources: Population and Employment Forecasts provided by the Region of Halton Planning and Development Department (mid-point of ranges are used)

Waste Quantities Forecast prepared by C.N. Watson and Associates Ltd., based on assumptions detailed in text.

Table 31

Projected Waste Generation by Zone 1986

Mun.	Zone	Population	Residential Waste Generation (tonnes)	Employment	Non-Residential Waste Generation (tonnes)	Total Waste (tonnes)
Burl.	1	35,658	12,694	13,150	13,005	25,699
	2	43,742	15,572	2,716	2,686	18,258
	3	30	11	23,004	22,751	22,762
	4	11,642	4,144	1,067	1,055	5,199
	5	28,965	10,312	3,161	3,126	13,438
	6	3,945	1,404	2,510	2,482	3,886
	7	628	224	137	135	359
	8	731	260	225	222	482
	9	2,918	1,039	338	334	1,373
	Total	128,259	45,660	46,308	45,796	91,456
Oak.	10	27,776	9,888	3,321	4,738	14,626
	11	2,163	770	4,758	6,787	7,557
	12	17,881	6,366	8,362	11,929	18,295
	13	14,337	5,104	9,162	13,070	18,174
	14	9,594	3,415	1,699	2,424	5,839
	15	9,881	3,518	9,547	13,619	17,137
	16	457	163	56	80	243
	17	7,668	2,730	968	1,381	4,111
	18	301	107	35	50	157
	Total	90,058	32,061	37,908	54,078	86,139
Mil.	19	1,178	419	391	157	576
	20	989	352	143	57	409
	21	22,598	8,045	8,915	3,567	11,612
	22	2,199	783	579	232	1,015
	23	1,056	376	199	80	456
	24	2,586	921	281	112	1,033
	Total	30,606	10,896	10,508	4,205	15,101

Table 31 cont'd.

Mun.	Zone	Population	Residential Waste Generation (tonnes)	Employment	Non-Residential Waste Generation (tonnes)	Total Waste (tonnes)
Halt. Hills	25	914	325	141	65	390
	26	1,535	547	194	89	636
	27	25,076	8,927	8,534	3,932	12,859
	28	1,272	453	242	111	564
	29	9,957	3,545	2,791	1,286	4,831
	30	1,548	551	351	162	713
	Total	40,302	14,348	12,253	5,645	19,993
TOTAL REGION		289,225	102,965	106,977	109,724	212,689

Sources: Population and Employment Forecasts provided by the Region of Halton Planning and Development Department (mid-point of ranges are used)

Waste Quantities Forecast prepared by C.N. Watson and Associates Ltd., based on assumptions detailed in text.

Region of Halton Waste Forecasts, 1986 and 2001

	1986		2001	
	Tons	Tonnes	Tons	Tonnes
Low	215,518	195,481	247,000	224,036
Mid-Point	234,490	212,689	303,680	275,447
High	253,462	229,898	360,360	326,857

The year 1986 and 2001 wereselectd for analysis to represent the Region's situation early in the projection period, and in athe longer term.

9.2.3 1982 Halton Waste Generation

The estimated tonnage of waste generated in Halton by municipality and by type of waste generator (residential vs. non-residential) for 1982 is shown on page 18 (Table 8) of tahe Stage 1 report. The total waste and residential waste for each area municipality was estimated based on historical information on the Halton landfill sites and the "Solid Waste Source Separation Market Development Programs" report (Resource Integration System), page 40. The residential waste was forecast to range from 0.365 - 0.42 tons per capita per year (2.0 - 2.3 lbs/capita/day). The mid-point of this range is 0.393 tons/capita/annum. In metric tonnes, this figure would be 0.356 tonnes per capita per annum. The non-residential waste was treated as the residual between the residential and total waste in each case. The 1982 figures formed the basis for the division of waste among the municipalities and between the waste types for the forecast years. The long term projection will be considered initially.

9.2.3 2001 Waste Generation by Zone Forecast

The 2001 waste forecast by municipality and type of waste was completed in the Stage 1 analysis (Page 47, Table 20), and attached here as

Table 32. Similar to the 1982 estimates, the residential and total waste categories were calculated and the non-residential waste treated as the residual. This methodology formed the basis for the calculation of the zonal breakdown as shown on Table 30.

The residential waste generation by zone for 2001 was determined based on the mid-point of the waste per capita figure used in Table 29. The figure was 0.356 tonnes per capita per annum, assuming no change from the present during the forecast period. Residential waste generation is not affected by economic conditions, industrial processes, shifts in types of employment as in non-residential waste. The tonnes per capita figure was multiplied by the population projection for 2001 for each zone and the results are included in Table 30.

The forecast of total waste for each municipality was calculated based on the information on Table 32. The distribution of total waste for 2001 (based on the mid-point of the range) as compared with 1982 is as follows:

Estimated Municipal Waste Generation in Halton
1982, 2001

	1983		2001	
	Tonnes	%	Tonnes	%
Burlington	80,726	43.4	109,077	39.6
Oakville	73,575	39.5	120,646	43.8
Milton	14,512	7.8	17,629	6.4
Halton Hills	17,233	9.3	28,095	10.2
TOTAL REGION	186,046	100.0	275,447	100.0

Non-residential waste for each municipality represented the difference between residential waste and total waste. An average waste per employee ratio was then calculated for each municipality and applied to the employment forecast in each zone to approximate the non-residential waste generation by zone as shown below. The 2001 waste generation per employee factors are as follows:

TABLE 32 - ESTIMATED QUANTITY OF WASTE TO BE DISPOSED OF BY HALTON IN THE YEAR 2001 BY LOCATIONS & TYPE OF WASTE GENERATOR

	Actual[1] Tonnage/Capita 1982	Forecast[2] Tonnage/Capita 2001	Forecast[3] Population/Capita 2001	Forecast[4] Tonnage 2001	Residential[5] Tonnage 2001	Non-Residential[6] Tonnage 2001
BURLINGTON	.787	.73 - .84	134,500 - 170,000	98 - 142	47 - 74	51 - 68
OAKVILLE	1.057	.98 -1.13	109,188 - 141,000	107 - 159	38 - 62	69 - 97
MILTON	.541	.51 - .59	32,643 - 37,000	17 - 22	11 - 16	6
HALTON HILLS	.549	.52 - .60	48,668 - 61,500	25 - 37	17 - 27	8 - 10
HALTON REGION	.807	.76 - .88	325,000 - 409,500	247 - 360	113 - 179	134 - 181

SOURCE: Forecast by C. N. Watson and Associates Ltd.

1 Table 17 and calculations from Table 8.
2 Table 19 and extrapolations of Column 1.
3 Table 15
4 Column 2 times Column 3.
5 1.9 - 2.4 pounds per capita per day times the population forecasts in Table 15
6 Residual between total waste and Residential Waste.

N.B. Table numbers refer to "Stage 1: Waste Needs and Systems Analysis" Report.

Non-Residential Waste Per Employee, 2001

	Waste Quantity	Employment	Waste/Employee Ratio
Burlington	54,874	60,258	0.911
Oakville	76,108	54,403	1.399
Milton	5,237	14,803	0.354
Halton Hills	8,476	18,705	0.453
TOTAL REGION	144,695	148,169	0.977

These figures indicate significant variation in non-residential waste per employee standards among Halton municipalities. As noted in the Stage 1 report, these differences are common in that the amount of waste generated by different types of industries is highly variable.

Further, the Halton Region 1983 Industrial Waste Survey[8] indicated an overall Regional ratio of waste per employee as follows:

	Waste Landfilled (tonnes)	Employment	Waste per Employee
Total Region	28,030	25,497	1.10
Total Region (excluding Beardmore Tannery)[9]	22,032	25,117	0.88

[8]May 5, 1983 tabulation.

[9]This industry produces a significant amount of waste and does not currently landfill at the Halton site.

The projected 2001 ratio of 0.98 for non-residential waste generation per employee is consistent with the range established in the industrial waste survey.

9.2.4 1986 Waste Generation by Zone Forecast

The 1986 projection of waste generation by zone was completed using the same methodology as the 2001 forecast. The results are shown on Table 31.

The distribution of the total waste forecast for 1986 among the municipalities (based on the mid-point of the range) as compared with 1982 is as follows:

Estimated Municipal Waste Generation in Halton
1982, 1986

	1982		1986	
	Tonnes	%	Tonnes	%
Burlington	80,726	43.4	91,456	43.0
Oakville	73,575	39.5	86,139	40.5
Milton	14,512	7.8	15,101	7.1
Halton Hills	17,233	9.3	19,993	9.4
TOTAL REGION	186,046	100.0	212,689	100.0

9.3 Evaluation Process

An analysis of haul costs by zone was undertaken for the 19 zones defined as potential candidate zones for 1986 and 2001; it is included as Appendix 2. The major assumptions were:

- One way travel times between each municipal waste centroid and the waste zone analysis provided from Section 8.
- On-site disposal time of 15 minutes at the landfill site and 8 minutes at a transfer station.

- Cost per tonne minute factors developed in the Stage 1 report.
- Transfer station costs[10] from the Stage 1 report.
- Total Region figures based on a weighted average calculated using the proportion of waste from each municipality in each forecast year.

9.3.1 Region of Halton Haul Cost Evaluation

The 1986 and 2001 results of the haul costs analysis for Halton Region are summarized on Table 33. The data indicates that:

- The urban municipalities of Burlington and Oakville, which generate the vast majority of the Region's wastes, have low impact ratings in all their zones.
- Halton Hills and the northern section of Milton have low to moderate and moderate ratings since they are more distant from the major sources of waste.
- The haul cost ranges do not change significantly between 1986 and 2001 in any of the zones. As a result, further analysis in this section has been undertaken for the 2001 data only.

The range of Regional haul costs on Table 33 produce only two levels of impact (low and moderate) since there are no zones with haul costs over $13.00 per tonne, the level defined as high impact. This will be reviewed for the final report. It occurred because the level of impact categories for haul costs were based on the range for the four individual municipalities in the Stage 1 report; they will be discussed subsequently. The Regional weighted average produces a lower range, since Halton Hills which has the highest haul costs generates only 10% of the Region's wastes.

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[10]The assumption of a transfer station for certain zones in Halton Hills was included only because there is an existing temporary transfer station. The issue of where, if any, transfer stations might be required, will be part of a later phase in the study.

Table 33

C.2 Evaluation of the Haul Costs Factor for Region
(1982 dollars)

Municipality	Zone	1986		2001	
		$/tonne range	Level of Impact	$/tonne range	Level of Impact
Burlington	3	4.05- 5.14	L	4.08- 5.20	L
	6	5.43- 6.79	L	5.48- 6.89	L
	7	5.50- 6.90	L	5.44- 6.87	L
	8	5.13- 6.45	L	5.06- 6.40	L
	9	5.89- 7.39	L	6.01- 7.56	L
Oakville	16	4.38- 5.56	L	4.43- 5.64	L
	18	4.73- 6.01	L	4.70- 6.00	L
Milton	19	4.77- 5.83	L	4.72- 5.76	L
	20	5.61- 6.85	L	5.11- 6.25	L
	21	6.09- 7.44	L	6.03- 7.37	L
	22	6.92- 8.68	L-M	7.04- 8.85	L-M
	23	7.59- 9.27	L-M	7.67- 9.38	L-M
	24	8.53-10.43	M	8.61-10.52	M
Halton Hills	25	7.13- 8.72	L-M	7.10- 8.67	L-M
	26	7.43- 9.08	L-M	5.87- 7.18	L
	27	9.16-11.20	M	7.51- 9.18	L-M
	28	8.41-10.28	M	8.28-10.12	M
	29	9.35-11.43	M	9.38-11.47	M
	30	9.72-11.88	M	9.59-11.73	M

L = Low M = Moderate

SOURCE: Calculated by C.N. Watson and Associates Ltd., in Appendix_____.

Table 34 identifies the low and high haul cost zones by ranking the 2001 Regional data in ascending order. The following results are noteworthy:

- o The $4.00 to $6.00 per tonne range are dominated by urban or near urban zones in the south, including the two Oakville zones.
- o In the $5.00 to $7.00 per tonne range, the remaining Burlington and eastern Milton zones are included along with a southern zone in Halton Hills (26).
- o The higher cost per tonne range ($7.00 to $12.00) is associated with the western Milton area and most of the Halton Hills zones. As indicated previously, this reflects their distance from the major Regional waste generators.

To this point, the haul costs analysis has focussed on the selection of a single site for Halton's future landfilling needs. However, the possibility of sites to serve different parts of the municipality also should be considered at this stage. Tables 35 and 36 illustrate the impact on haul costs of utilizing dual sites based on north:south and east:west locations respectively. The selection of the paired sites was done only on a random geographic basis. They may not include the optimal one.

The dual zone figures were calculated based on the least cost destination for each municipality and then a weighted Regional avaerage for the dual sites calculated.

The data on Tables 35 and 36 illustrate that there is a potentially significant savings in haul costs using dual landfill sites rather than a single one. In each case, the savings from dual site examples over one of the component sites (based on the mid-point of the range) is as follows:

	Zone	% Saving	Zone	% Saving
North:South	6	25	30	56
	16	22	23	24
	8	24	28	52
East:West	18	12	7	23
	26	10	22	26
	27	34	9	19

Table 33

C.2 Evaluation of the Haul Costs Factor for Region
(1982 dollars)

Municipality	Zone	1986		2001	
		$/tonne range	Level of Impact	$/tonne range	Level of Impact
Burlington	3	4.05- 5.14	L	4.08- 5.20	L
	6	5.43- 6.79	L	5.48- 6.89	L
	7	5.50- 6.90	L	5.44- 6.87	L
	8	5.13- 6.45	L	5.06- 6.40	L
	9	5.89- 7.39	L	6.01- 7.56	L
Oakville	16	4.38- 5.56	L	4.43- 5.64	L
	18	4.73- 6.01	L	4.70- 6.00	L
Milton	19	4.77- 5.83	L	4.72- 5.76	L
	20	5.61- 6.85	L	5.11- 6.25	L
	21	6.09- 7.44	L	6.03- 7.37	L
	22	6.92- 8.68	L-M	7.04- 8.85	L-M
	23	7.59- 9.27	L-M	7.67- 9.38	L-M
	24	8.53-10.43	M	8.61-10.52	M
Halton Hills	25	7.13- 8.72	L-M	7.10- 8.67	L-M
	26	7.43- 9.08	L-M	5.87- 7.18	L
	27	9.16-11.20	M	7.51- 9.18	L-M
	28	8.41-10.28	M	8.28-10.12	M
	29	9.35-11.43	M	9.38-11.47	M
	30	9.72-11.88	M	9.59-11.73	M

L = Low M = Moderate

SOURCE: Calculated by C.N. Watson and Associates Ltd., in Appendix_____.

Table 34

2001 Regional Haul Costs by Zone in Ascending Cost Per Tonne Range
(1982 dollars)

ZONE	MUNICIPALITY	$/tonne	Ranking
3	Burlington	4.08- 5.20	1
16	Oakville	4.43- 5.64	2
19	Milton	4.72- 5.76	3
18	Oakville	4.70- 6.00	4
20	Milton	5.11- 6.25	5
8	Burlington	5.06- 6.40	6
7	Burlington	5.44- 6.87	7
6	Burlington	5.48- 6.89	8
26	Halton Hills	5.87- 7.18	9
21	Milton	6.03- 7.37	10
9	Burlington	6.01- 7.56	11
25	Halton Hills	7.10- 8.67	12
22	Milton	7.04- 8.85	13
27	Halton Hills	7.51- 9.18	14
23	Milton	7.67- 9.38	15
28	Halton Hills	8.28-10.12	16
24	Milton	8.61-10.52	17
29	Halton Hills	9.38-11.47	18
30	Halton Hills	9.59-11.73	19

SOURCE: Calculated by C.N. Watson and Associates Limited.

Table 35

Impact on 2001 Haul Costs of Dual North: South Sites
(1982 dollars)

	ZONE 6 ($/tonne)	ZONE 30 ($/tonne)	ZONE 6/30 ($/tonne)
Burlington	2.97- 3.63	11.07-13.53	2.97- 3.63
Oakville	5.31- 6.49	10.35-12.65	5.31- 6.49
Milton	9.09-11.11	5.85- 7.15	5.85- 7.15
Halton Hills	13.71-18.60	2.97- 3.63	2.97- 3.63
Total Region	5.48- 6.89	9.59-11.73	4.18- 5.11

	ZONE 16 ($/tonne)	ZONE 23 ($/tonne)	ZONE 16/23 ($/tonne)
Burlington	3.51- 4.29	7.11- 8.69	3.51- 4.29
Oakville	3.33- 4.07	9.27-11.33	3.33- 4.07
Milton	5.67- 6.93	3.15- 3.85	3.15- 3.85
Halton Hills	11.91-16.80	5.85- 7.15	5.85- 7.15
Total Region	4.43- 5.64	7.67- 9.38	3.65- 4.46

	ZONE 8 ($/tonne)	ZONE 28 ($/tonne)	ZONE 8/28 ($/tonne)
Burlington	3.33- 4.07	8.91-10.89	3.33- 4.07
Oakville	4.77- 5.83	9.63-11.77	4.77- 5.83
Milton	6.39- 7.81	3.33- 4.07	3.33- 4.07
Halton Hills	12.15-17.04	3.15- 3.85	3.15- 3.85
Total Region	5.06- 6.40	8.28-10.12	3.94- 4.82

SOURCE: Calculated by C.N. Watson & Associates Ltd.

Table 36

Impact on 2001 Haul Costs of Dual East: West Sites
(1982 dollars)

	ZONE 18 ($/tonne)	ZONE 7 ($/tonne)	ZONE 18/7 ($/tonne)
Burlington	4.77- 5.83	3.33- 4.07	3.33- 4.07
Oakville	3.15- 3.85	5.49- 6.71	3.15- 3.85
Milton	5.13- 6.27	7.11- 8.69	5.13- 6.27
Halton Hills	10.83-15.72	12.39-17.28	10.83-15.72
Total Region	4.70- 6.00	5.44- 6.87	4.13- 5.30

	ZONE 26 ($/tonne)	ZONE 22 ($/tonne)	ZONE 26/22 ($/tonne)
Burlington	7.11- 8.69	5.67- 6.93	5.67- 6.93
Oakville	5.49- 6.71	7.65- 9.35	5.49- 6.71
Milton	4.05- 4.95	4.41- 5.39	4.05- 4.95
Halton Hills	3.87- 4.73	11.43-16.32	3.87- 4.73
Total Region	5.87- 7.18	7.04-8.85	5.30- 6.48

	ZONE 27 ($/tonne)	ZONE 9 ($/tonne)	ZONE 27/9 ($/tonne)
Burlington	9.09-11.11	4.05- 4.95	4.05- 4.95
Oakville	7.47- 9.13	6.21- 7.59	6.21- 7.59
Milton	5.49- 6.71	6.39- 7.81	5.49- 6.71
Halton Hills	2.79- 3.41	12.51-17.40	2.79- 3.41
Total Region	7.51- 9.18	6.01- 7.56	4.96- 6.06

SOURCE: Calculated by C.N. Watson and Associates Ltd.

In comparing the Regional haul costs for the dual examples with the data for the lowest cost single sites shown on Table 34, four of the six combinations are within the same range ($4.00 to $6.00 per tonne) but none are lower. However, as noted previously, the optimal combination may not have been included. This will be explored further in the next phase when candidate areas have been selected.

9.3.2 Haul Cost Evaluation by Municipality

Figure 5 illustrates the level of impact on haul cost for each municipality (on a schematic diagram of the Region) if the landfill site was located in each of the receiver zones. The weighted average cost for the Region as a whole has also been included. The level of impact for each municipality is significant in that a low Regional average may result from low haul costs in three municipalities and a high one in the fourth municipality. It is anticipated that an undue haul cost burden will not be placed on one municipaliaty without some form of compensation.

9.4 Conclusion

Land costs and haul costs are interrelated in that proximity to urban areas generally results in shorter haul time (and thus lower costs) but higher land costs. Table 37 combines these two economic factors and illustrates this interrelationship.

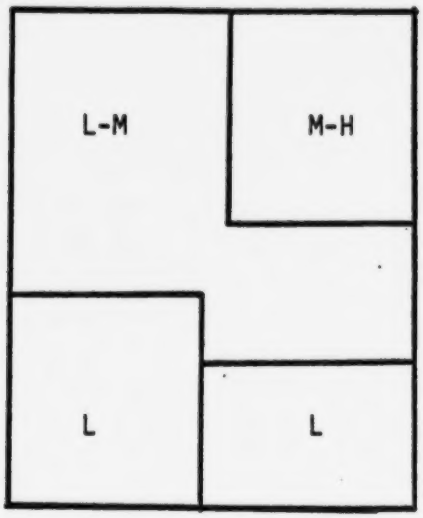
The land cost per tonne per annum figures were calculated using a factor consistent with the information in the Stage 1 Report. They are annual costs which will increase with inflation (assumed at 9% per annum), similiar to the haul costs.

Table 37 illustrates two important conclusions about the economic factors evaluated:

Figure 5

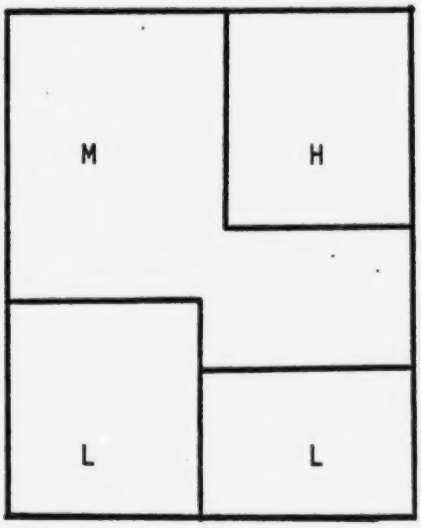
2001 Haul Cost Evaluation by Municipality

BURLINGTON



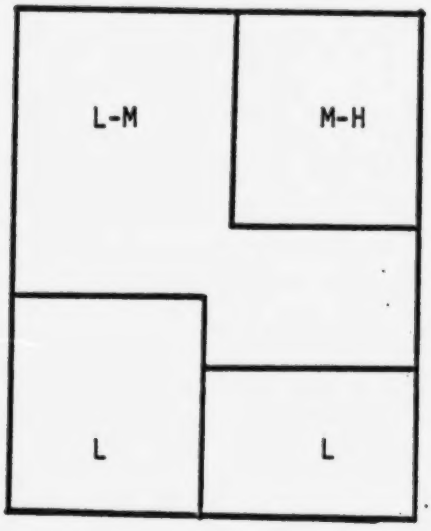
ZONE 3

Region: $4.08 - $5.20



ZONE 6

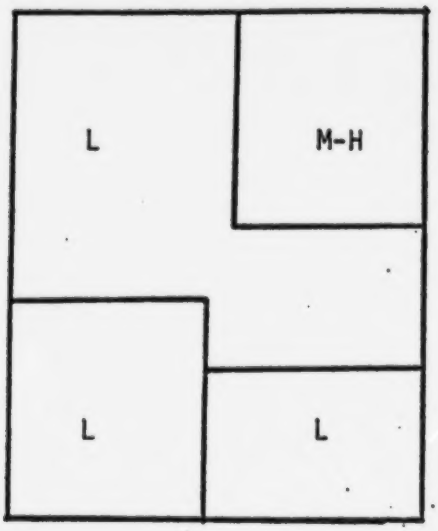
Region: $5.48 - 6.89



ZONE 7

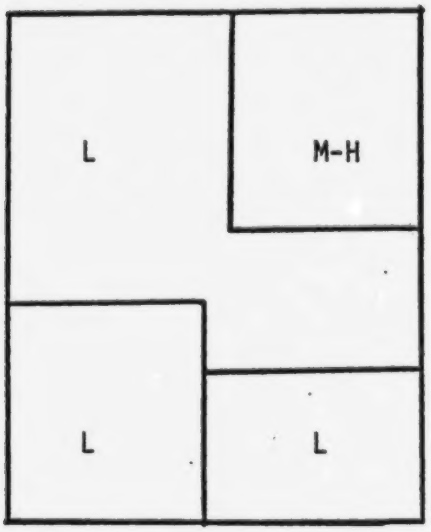
Region: $5.44 --$6.87

BURLINGTON (cont'd.)



ZONE 8

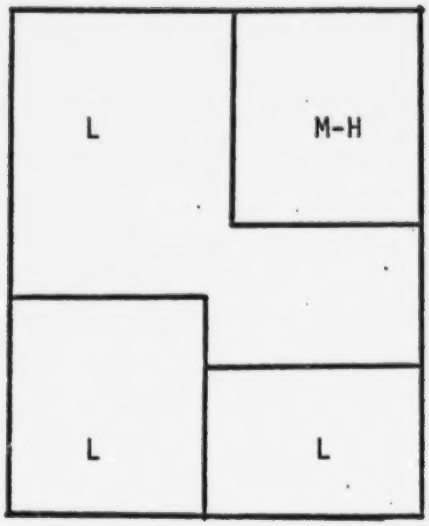
Region: $5.06 - $6.40



ZONE 9

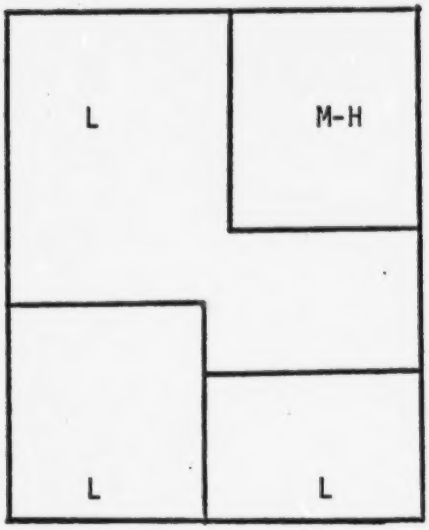
Region: $6.01 - $7.56

OAKVILLE



ZONE 16

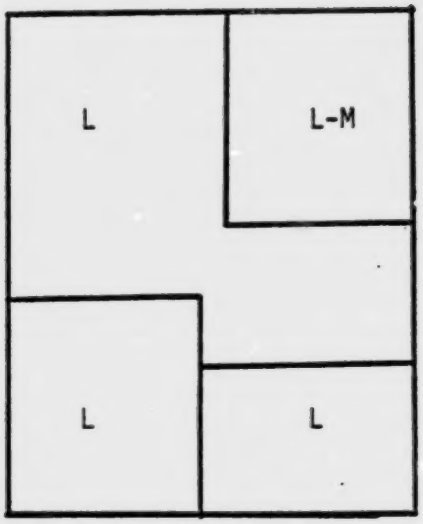
Region: $4.43 - $5.64



ZONE 18

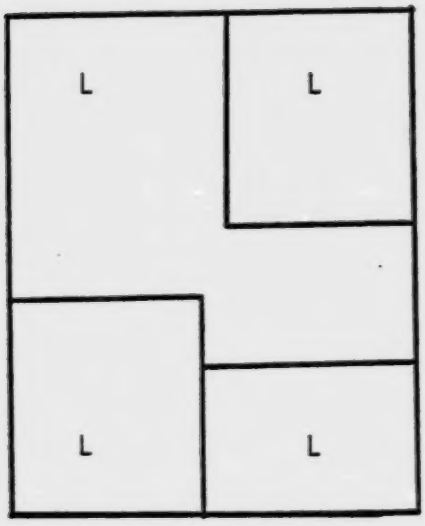
Region: $4.70 - $6.00

MILTON



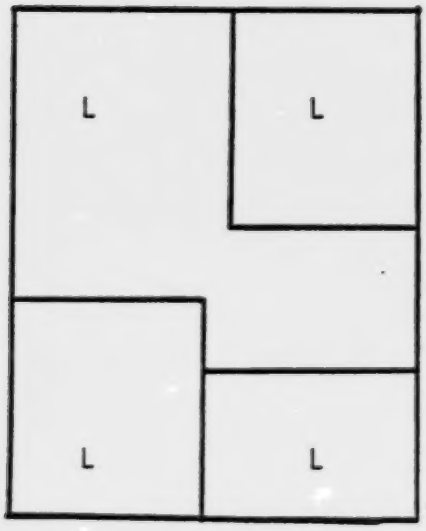
ZONE 19

Region: $4.72 - $5.76



ZONE 20

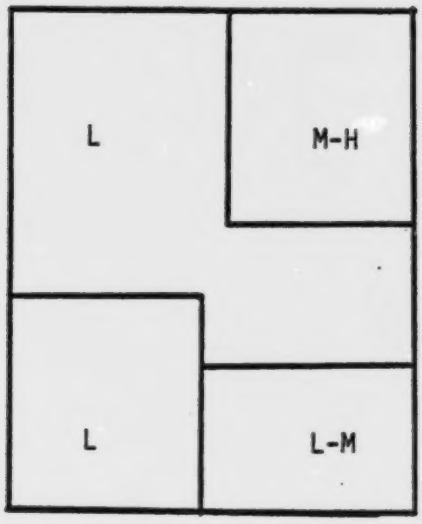
Region: $5.11 - $6.25



ZONE 21

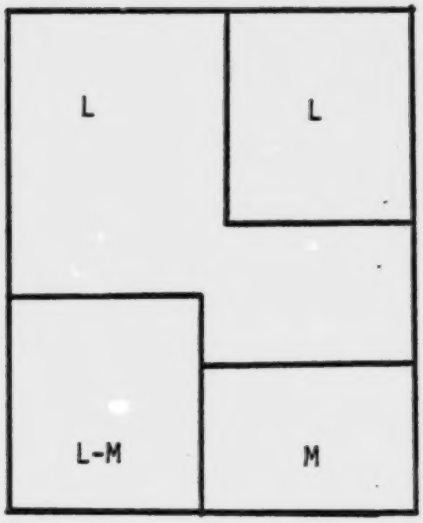
Region: $6.03 - $7.37

MILTON (cont'd)



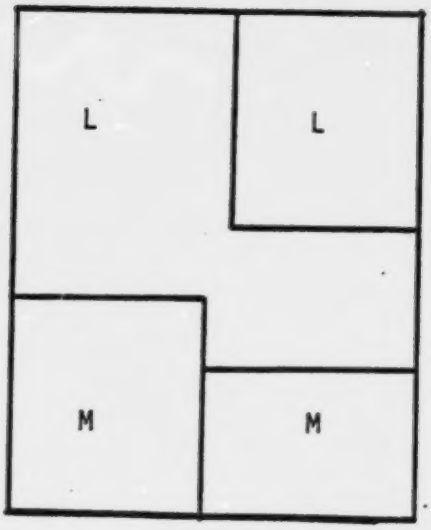
ZONE 22

Region: $7.04 - $8.85



ZONE 23

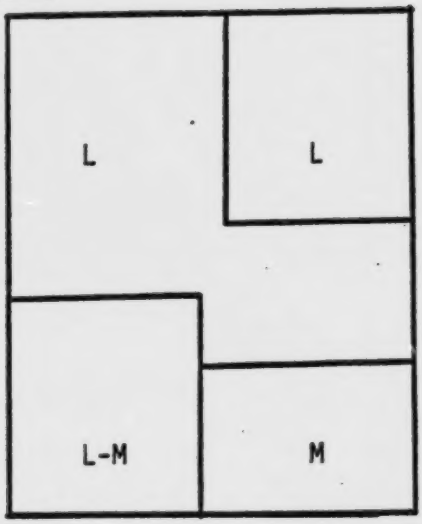
Region: $7.67 - $9.38



ZONE 24

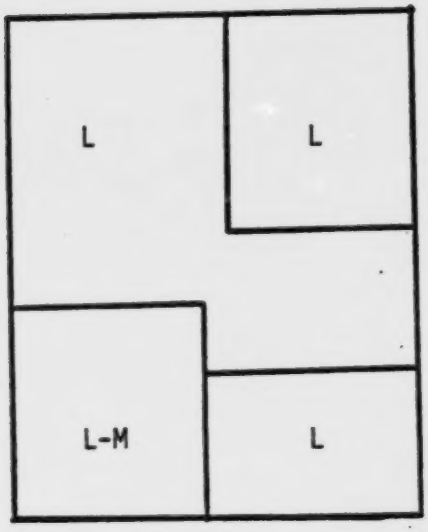
Region: $8.61 - $10.52

HALTON HILLS



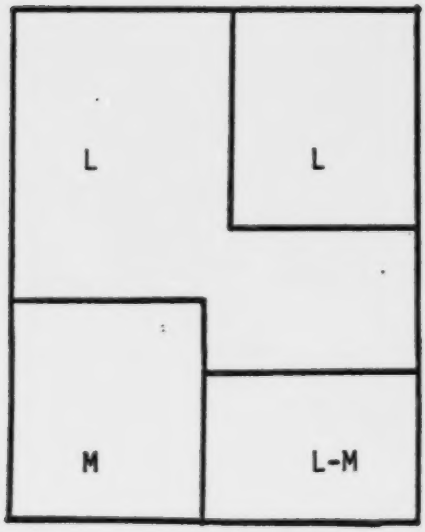
ZONE 25

Region: $7.10 - $8.67



ZONE 26

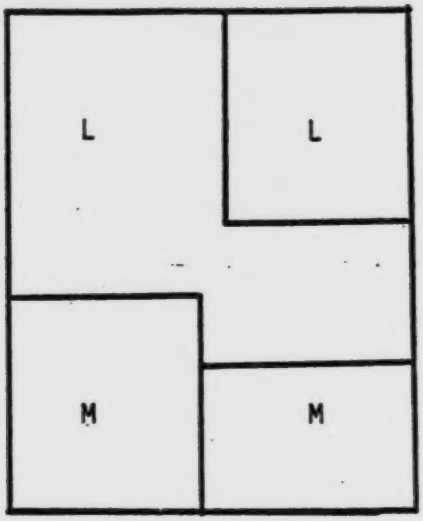
Region: $5.87 - $7.18



ZONE 27

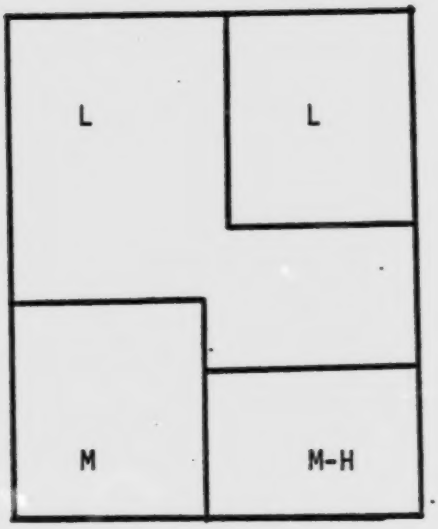
Region: $7.51 - $9.18

HALTON HILLS (cont'd)



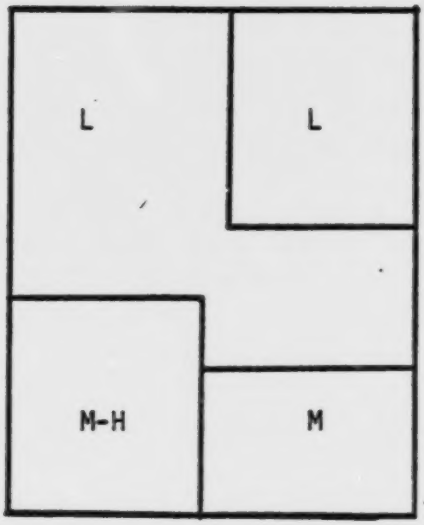
ZONE 28

Region: $8.28 - $10.12



ZONE 29

Region: $9.38 - $11.47



ZONE 30

Region: $9.59 --$11.73

SOURCE: Calculated by C.N. Watson and Associates in Appendix_____

- Land costs represent only a fraction of haul costs when the two are compared on an equal basis. Accordingly, more attention should be directed to minimizing haul costs.

- The total cost per tonne figures combining land and haul costs for Halton Region confim that, despite lower land prices in the northern rural zones of Milton and Halton Hills, total costs are higher than those in proximity to the urbanized southern area.

Table 37

Combined Land and Haul Costs for Halton Region

(1982 dollars)

Municipality	Zone	Land Cost[2] ($/tonne/annum)	2001 Haul Costs[3] ($/tonne)	Total Costs $
Burlington	6	1.32	5.48- 6.89	6.80- 8.21
	7	0.66- 1.32	5.44- 6.87	6.10- 8.19
	8	0.66- 1.32	5.06- 6.40	5.72- 7.72
	9	0.66- 0.83	6.01- 7.56	6.67- 8.39
Oakville	16	0.83- 1.32	4.43- 5.64	5.26- 6.96
	18	0.83- 1.32	4.70- 6.00	5.53- 7.32
Milton	19	0.53- 0.57	4.72- 5.76	5.25- 6.33
	20[1]	0.53- 0.57	5.11- 6.25	5.64- 6.82
	22[1]	0.49- 0.57	7.04- 8.85	7.53- 9.42
	23	0.31- 0.41	7.67- 9.38	7.98- 9.79
	24	0.31- 0.41	8.61-10.52	8.92-10.93
Halton Hills	25	0.57- 0.66	7.10- 8.67	7.67- 9.33
	26	0.57- 0.66	5.87- 7.18	6.44- 7.84
	27[1]	0.83- 2.14[4]	7.51- 9.18	8.34-11.32
	28	0.41- 0.66	8.28-10.12	8.69-10.78
	29[1]	0.27- 0.45	9.38-11.47	9.65-11.92
	30	0.27- 0.45	9.59-11.73	9.86-12.18

1. Zone boundaries vary somewhat between the land and haul cost zones. Zones 3 and 21 were not considered in the land cost analysis. Zones 20 and 22 incorporate the rural areas of Zone 21 and Zone 3 was considered committed for urban development.

2. Calculated from information contained in Table ___ using a factor of $0.66/tonne for $9,900/hectare of land cost ($0.60/ton for $4,000/acre of land cost)

3. Table ___

4. Figure reflects land values along Highway 7 on the outskirts of Georgetown.

SECTION 10 - CULTURAL ANALYSIS

10.1 Introduction

This section deals with Evaluation Factor D.1 and D.2 of the General Overview Analysis. In this group of factors, the existence of known historical or archaeological sites is rated as a "high" impact.

The intent of the review is to consider the heritage features in Halton which have been identified from secondary sources. The primary source used was the Halton Heritage Study prepared by the Region of Halton, October, 1982.

Known archaeological features were identified in a separate report, prepared by the Museum of Indian Archaeology entitled "Background Study on the Archaeological Resources of Halton", November 1982. Archaeological features have been taken into consideration in the final analysis of candidate areas.

10.2 Approach

Although numerous features have been identified in Halton, a relatively small proportion of these have been designated as properties of heritage significance under the Ontario Heritage Act, 1974. Because identified heritage features are so numerous and widely distributed, the recognition of all these sites in the General Overview Analysis would be inappropriate. For the purpose of the General Overview Analysis, only designated properties of heritage significance will be identifed. However, in order to provide general context for the heritage analysis, general information concerning identified features is provided below.

10.3 Halton Heritage Study (1981)

This study was prepared by the Planning and Development Department of the Regional Municipality of Halton, and provides a comprehensive overview and inventory of identified heritage features. The study established major historical themes (settlement, economic activity, transportation) and considers

features in the context of their respective historical periods. All features identified in the study satisfied one or more of the following criteria:

1) A structure of excellent quality and condition and representative of one historical theme;

2) Associated with two or more historical themes;

3) One of the few or sole remaining example(s) of a particular historical theme;

4) The site of a significant historical event;

5) Identified as Provincially significant; or

6) Important to the development of an urban area.

Each heritage feature was described as having a form of protection, as follows:

1) The feature has been improved through private investment resulting in conversion to a new economic or commercial use;

2) The feature's original use is still viable;

3) The feature is now publically owned;

4) The feature is recognized by a particular group (e.g. LACAC, NEG, Historical Society);

5) The feature is designated under the Ontario Heritage Act; or

6) None. (The feature has no protection status).

The study identifies 337 "Halton Heritage Features" of which 222 were under the Settlement Theme, 21 under the Transportation Theme and 94 under the Economic Activity Theme.

10.4 Heritage Features Designated under the Ontario Heritage Act (1974)

Heritage designations are approved by the Councils of each Area Municipality, normally after recommendations have been made by their respective Local Architectural Conservation Advisory Committees (LACACs). The heritage features designated are as follows:

City of Burlington

470 Nelson Avenue (residence)
479 Nelson Avenue (residence)
2168 Guelph Line (farmhouse) (Halton Heritage Study ref. S-93)

Town of Halton Hills

Halton Hills has no LACAC, and no designated heritage features.

Town of Milton

The Milton LACAC was formed only in 1983. However, in 1982 Milton Council approved the designation of the Halton County Court and Gaol. (Halton Heritage Study ref. S-174).

Town of Oakville

Location	Halton Heritage Study Reference
Knox-16 Presbyterian Church, 1150 Dundas Street West	S-13
Merrick-Thomas House, Lakeside Park, Front Street	S-37
King's Castle, 21 Regency Court	-
Old Post Office Museum, Lakeside Park, Front Street	S-86
Palermo United Church, 2521 Dundas Street West	S-8
Erchless Estate, 4 Navy Street	S-21
Post House, 3075 Trafalgar Road	S-9
Reagan House, 85 Navy Street	S-29
MacLachan Preparatory School, 337-339 Trafalgar Road	S-88

The Town also has a designated Heritage District containing 108 structures, located within the urban area of Oakville. It is bounded by Lake Ontario to the south, Sixteen Mile Creek to the wast, William Street to the north and Allen Street to the east.

10.5 Interpretation

The majority of designated properties referred to above lie within the built-up, urban areas of the Region, which are rated as "unacceptable" for landfill under factor A.7. The remaining three features lie outside the built-up areas but within the "Urban Areas" as designated in the Regional Plan. These areas are rated "high" impact, under the evaluation factor A.7 of the General Overview Analysis - the same level of impact as for the heritage sites themselves. The three sites designated properties follows:

- Palermo United Church, Oakville (lies on the boundary of a "moderate" impact area);
- Knox-16 Presbyterian Church, Oakville; and
- Post House, Oakville.

10.6 Provincial Policy with respect to Heritage Features

The Final Proposed Plan for the Niagara Escarpment (reviewed separately) provides specific policies with respect to heritage features within the Niagara Escarpment Planning Area. These policies seek to maintain heritage resources through the preservation and reuse of heritage buildings, the harmonization of nearby new development, the use of interpretive techniques and the preservation of information where heritage features are to be destroyed.

10.7 Conclusion

It is unlikely that heritage features will play a major role in determining areas appropriate for further investigation for landfill through the General Overview Analysis. This is partly due to the relatively small number of designated heritage features, which are located within built-up urban areas.

SECTION 11 - SCREENING OF CANDIDATE AREAS

11.1 Introduction

The purpose of this section is to describe the process for screening candidate areas for the landfill component of Halton's solid waste management system. Initially, the areas considered hydrogeologically favourable for landfilling were identified consistent with the First Priority Item in the ranking system for the evaluation factors:

> First Priority item - Avoid disturbance or degredation of the natural environment, including landforms, natural habitate, major aquifers, preservation and conservation areas.

From the areas described above, a sequence of overlays was considered, consisting of the bi-ophysical evaluation factors and the land use compatibility factor. This process was followed to eliminate additional areas with "unacceptable" impacts. The remaining factors consist mainly of "low", "moderate" or "high" impacts and therefore, would not automatically eliminate areas as candidate areas. However, the candidate areas that remain as a result of overlaying absolute constraints, i.e. "unacceptable" impacts, include residual impacts ranging from the "low", "moderate" to "high" categories. All residual environmental impacts in eacch district have been documented in Tables 38 - 44 in Section 11.3.

11.2 Areas Hydrogeologically Favourable For Sanitary Landfilling

If all the evaluation factors used in Section 3 are overlayed, as shown on Figure 6, there are essentially no areas within the Region that fall consistently in the "low" impacat category and therefore no favourable areas for landfilling. Most of the factors applied to the assessment relate to the protection of groundwater and surface water resources which are stated as first priority items in the ranking of evaluation factors. Agricultural capability is a Second Priority Item, which was removed from the analysis to determine its effect on the constraints mapping.

Figure 6

AREAS HYDROGEOLOGICALLY FAVOURABLE FOR SANITARY LANDFILLING

LEGEND

Potential Impact from Sanitary Landfilling

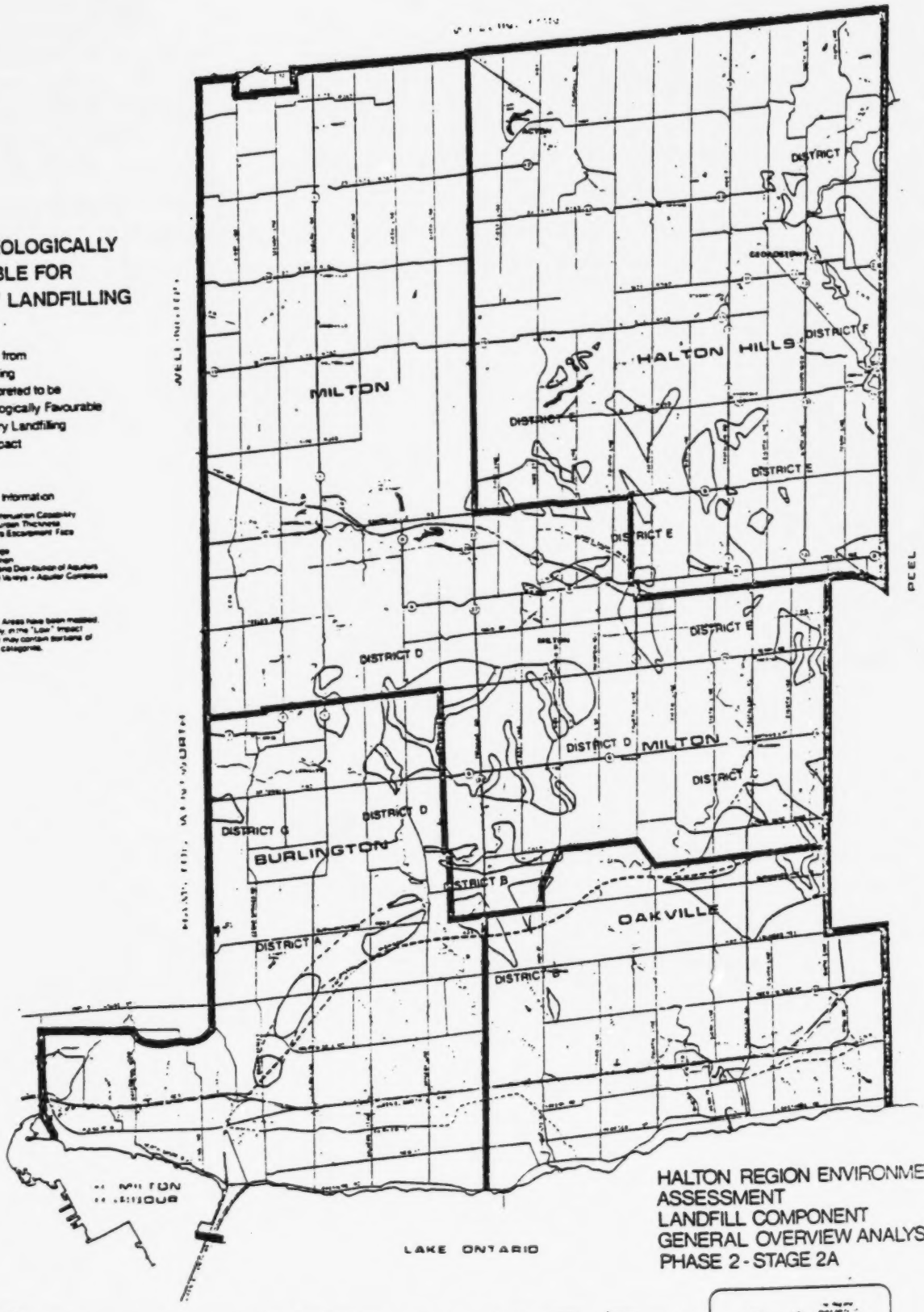
Area Interpreted to be Hydrogeologically Favourable for Sanitary Landfilling - Low Impact

Sources of Information

Map of Soil Attenuation Capability
Map of Overburden Thickness
Map of Niagara Escarpment Face
Map of Slope
Map of Drainage
Map of Infiltration
Map of Type and Distribution of Aquifers
Map of Buried Valleys - Aquifer Complexes

Notes

Districts and Areas have been mapped predominately on the "Low" Impact Category but may contain portions of other impact categories.



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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Halton

With the agricultural capability factor excluded, the analysis netted forty-five (45) areas of various sizes where the impact of landfilling is consistently "low" on a Regional mapping basis. The results of excluding the Agricultural potential are not surprising as it is general knowledge in the hydrogeologic community that good agricultural lands often comprise the fine-grained loams that are also good attenuators of landfill contaminants.

Therefore, the identified areas on Figure 6 that are hydrogeologically favourable for sanitary landfilling are based on the following factors:

- Attenuation capability
- Overburden thickness
- Niagara Escarpment Face and slopes
- Drainage
- Infiltration
- Type and distribution of aquifers; overburden and bedrock
- Buried valleys - aquifer complexes

All but one of the identified areas on Figure 6 are situated east of the Niagara Escarpment on thick sequences of glacial till. Groundwater supply is predominantly obtained from the Queenston shale or from sand and gravel lenses and beds within the till. One area above the Escarpment was identified as a potential candidate area.

For discsussion purposes, the forty-five potential landfill areas were grouped into seven districts. Districts are based on geographic proximity and aggregation of potential candidate areas. The districts are described below.

11.2.1 District A

This district is found in the southwest portion of the Region extending northeast from the Queen Elizabeth Way to Burnhamthorpe Road near Bronte Creek. The topography is flat to rolling. The terrain is composed chiefly of

clayey or silty till. Water supplies are derived from the Queenston shale bedrock. There are four potential areas in this district ranging in size from 25 to 225 hectares.

11.2.3 District B

District B is found in the south central part of the Region. This distsrict extends northerly from Upper Middle Road to an area near the Lower Base Line. The terrain is a flat to rolling till plain composed predominantly of clayey or silty till. The bedrock forms the main groundwater aquifer for wells in the area. The district consists of five potential sites that range in size from approximately 30 to 250 hectares.

11.2.4 District C

Distrit C is located in the area around Trafalgar Road and Burnhamthorpe Road in the southeast portion of the Region. The terrain is rolling to hummocky, composed chiefly of clayey to silty till. Two potential landfill areas are found in this district, ranging in size from about 75 to 1500 hectares.

11.2.5 District D

District D is found in the central part of the Region in the areas surrounding Britannia Road and Tremaine Road. The terrain is rolling to hummocky composed predominantly of clayey to silty till. Groundwater supplies are obtained from the Queenston shale. There are three potential areas in this District. They range in size from about 40 to 2500 hectares.

11.2.6 District E

District E is an aggregate of scattered potential areas found in the east central and central parts of the Region. Many of the areas are north of Highway 401 in Halton Hills. The terrain is flat to rolling and is composed chiefly of clayey or silty till. Groundwater wells obtained their water from discrete sand and gravel lenses and beds within the till and from the Queenston Shale.

Figure 7

CANDIDATE AREAS FOR SANITARY LANDFILL SITE(S)

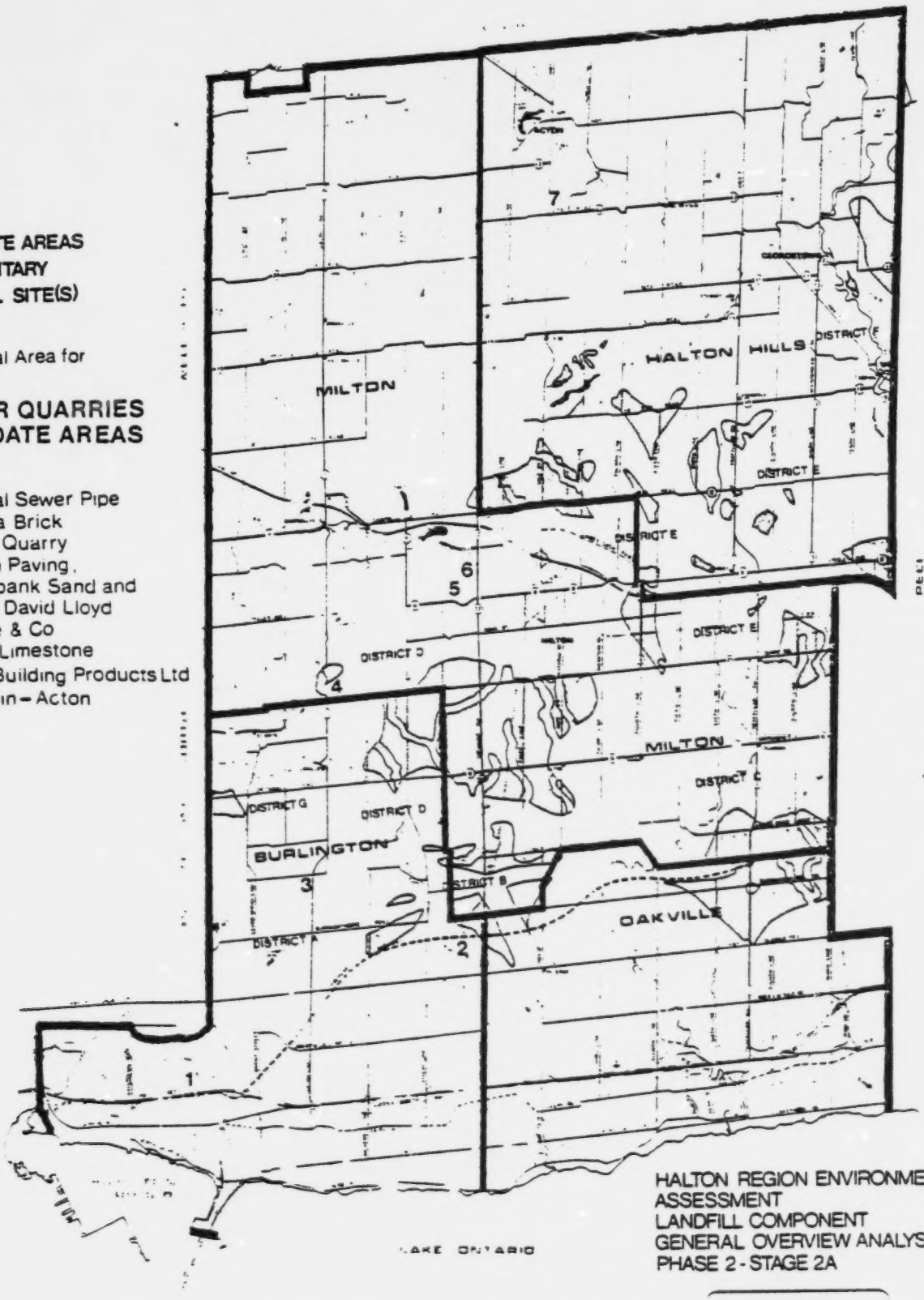
LEGEND

☐ Potential Area for Landfill

PITS OR QUARRIES CANDIDATE AREAS

LEGEND

1 National Sewer Pipe
2 Canada Brick
3 Nelson Quarry
4 Warren Paving, Springbank Sand and Gravel, David Lloyd George & Co
5 Milton Limestone
6 RBD Building Products Ltd
7 Indusmin – Acton



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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There are twenty-three potential areas that range in size from about 5 to 500 hectares.

11.2.7 District F

This district is found northeast of Georgetown,. The terrain is a flat to rolling till plain, composed predominantly of clayey or silty till. There are seven potential areas in this district ranging in size from about 20 to 400 hectares.

11.2.8 District G

This district is the only favourable area found abouve the Niagara Escarpment. It is located southwest of Lowville. The area is a rolling to hummocky upland, composed chiefly of clayey or silty till. Groundwater supplied are derived from dolostone of the Amabel formation. The District is estimated to have an area of about 75 hectares.

11.3 Candidate Areas

The primary basis for selection of candidate areas is Figure 6, Areas Hydrogeologically suitable for Sanitary Landfilling. However, additional areas within some of the Districts were eliminated due to the following conditions:

- presence of an "unacceptable" impact from other evaluation factor(s);

- presence of physical obstructions e.g. settlement areas, future Highway 403, and

- presence of Environmentally Sensitive Areas.

The candidate areas shown on Figure 7 will be investigated in more detail to identify potential landfill site(s). A summary of all environmental impacts in each candidate area is provided in Tables 38 to 44.

TABLE 38

DISTRICT A: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Nil	Nil	Till & Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability Classes 1, 2, 3, 4	Nil	
Slope			Slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded	Not Applicable	Areas over 100M from major watercourse	
Infiltration		Nil	Nil	Infiltration rate less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	Lies adjacent to area to be serviced in next 20 years			

TABLE 38 con't...

DISTRICT A: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas	Area on southwest fringe overlaps with Nelson Escarpment Woods (ESA no. 6) and is therefore excluded Southeastern extremity lies adjacent to Bronte Creek Valley at 2 points	Areas adjacent to Nelson Escarpment Woods		No impact for areas not lying within or adjacent to ESAs
LAND USE FACTORS Compatibility with Existing and Planned Use	An area along the eastern fringe of the District is occupied by part of the proposed route for Highway No. 403, and is therefore excluded		Most of the District lies within 1.6km of the Burlington planned Urban Area	Areas lying more than 1.6km from the designated areas
TRANSPORTATION FACTORS Traffic Service & Safety				Zone 8: Major access via Walker's Line from Highway system
SOCIAL FACTORS Population Density Community Services and Institutions			Southern part of District lies within Parkway Belt West	Less than 100 persons/ square kilometre

TABLE 38 con't...

DISTRICT A: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
ECONOMIC FACTORS Land Costs (1982 $) Haul Costs (1982 $)				Below $10,000/ha. (4000/ac) Zone 8
CULTURAL FACTORS Historical Archaeological Resources		(no known sites) Five known sites in southern part, with others in near vicinity		

TABLE 39

DISTRICT B: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Nil	Nil	Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability; Classes 1, 2, 3, 4	Nil	
Slope			Slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded	Not Applicable	Areas over 100M from Major	Watercourse
Infiltration		Nil	Nil	Infiltration rate less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley/aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	No planned or existing servicing in close proximity to District			

TABLE 39 con't...

DISTRICT B: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas				No Impact
LAND USE FACTORS Compatibility with Existing and Planned Use	Planned Rural Cluster P17 (Burnhamthorpe Road/Highway 27) is excluded, together with adjacent area		Areas in the south of the District lie within 1.6 km of Burlington/Oakville planned Urban Area Areas in the central and northeastern part of the District lie within 1.6 km of Planned Rural Cluster P17 (Burnhamthorpe Road/Highway 27)	Areas lying more than 1.6 km from the designated areas
TRANSPORTATION FACTORS Traffic Service and Safety			Zone 9: location of zone results in increasing haulage lengths not on highways	Zone 8: major access via Walker's Line from highway system Zone 16: maximum use of highways for haulage Zone 19: maximum use of highways for haulage
SOCIAL FACTORS Population Density Community Services and Institutions			Parkway Belt passes through southern part of District	Less than 100 persons/square kilometre

TABLE 39 con't...

DISTRICT 8: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
ECONOMIC FACTORS Land Costs (1982 $) Haul Costs (1982 $)			$10,000 - $50,000.00/ha. (approx. $4,000 - $20,000/ac) in areas within Oakville and Burlington	Less than $10,000.00/ha (approx. $4,000/ac) in areas within Milton Zones 8, 16, 19
CULTURAL FACTORS Historical Archaeological Resources		(no known designated heritage features) Eleven known sites, others in near vicinity		

TABLE 40

DISTRICT C: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Nil	Nil	Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability; classes 1, 2, 3, 4	Nil	
Slope			Slopes of 0-20%	
Distance from Major Watercourse	Areas within 100 metre setback were excluded	Not Applicable	Areas over 100M from major watercourse	
Infiltration		Nil	Nil	Infiltration less than 15 cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley/aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	Southern fringe of District lies in area to be serviced within next 20 years			

TABLE 40 con't...

DISTRICT C: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas		Part of southwestern fringe of District lies adjacent to East Sixteen Mile Creek (wetlands)		
LAND USE FACTORS Compatibility with Existing and Planned Use	Planned Rural Cluster P16 (Burnhamthorpe Road/Trafalgar Rd) excluded, together with adjacent area		Areas in the southeastern/ central part of the District lie within 1.6km of Planned Rural Cluster P16 (Burnhamthorpe Road/ Trafalgar Road) The northeastern fringe of the District lies within 1.6km of Drumquin Rural Cluster (P12)	Areas lying more than 1.6km from designated boundaries
TRANSPORTATION FACTORS Traffic Service and Safety				Zone 18: maximum use of highways for haulage Zone 20: major access via Trafalgar Road and Derry Road from highway system

TABLE 40 con't...

DISTRICT C: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
SOCIAL FACTORS				
Population Density				Less than 100 persons/square kilometres
Community Services and Institutions			Central and northeast part of District lies within Parkway Belt	
ECONOMIC FACTORS				
Land Costs (1982 $)			$10,000 - $50,000.00/ha (approx. $4,000 - $20,000/ac) within area lying in Oakville	Below $10,000.00/ha (approx. $4,000.00/ac) within area lying in Milton
Haul Costs (1982 $)				Zones 18 and 20
CULTURAL FACTORS				
Historical		One known designated Heritage Building in southern part of District		
Archaeological Resources		Seven known sites, others in near vicinity		

TABLE 41

DISTRICT D: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capbility		Nil	Nil	Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability classes 1, 2, 3, 4	Nil	
Slope		Small area of +20% slope in Mansewood, which is excluded under "Land Use" factors	In remaining area, slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded	Not Applicable	More than 100M from major watercourse	
Infiltration		Nil	Nil	Infiltration rate less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifers were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	An area in the western part of the District is serviced, but is excluded under "Land Use" factors. Part of District lies adjacent to servided areas.			

TABLE 41 con't...

DISTRICT D: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas	Area on the western fringe includes part of Crawford Lake - Rattlesnake Woods E.S.A.	Area near western fringe lies adjacent to Crawford Lake - Rattlesnake Woods E.S.A.	Area on southern fringe lies adjacent to "Spawning Nursery Area"	
LAND USE FACTORS Compatibility with Existing and Planned Land Use	Part of Milton built-up urban area and adjacent area excluded from northeast extremity of District	Northern extremity includes part of planned Milton Urban Area and lands adjacent	Northeastern areas of District lie within 1.6km of Milton Urban Area and/or Boyne Rural Cluster (P8) Southern part of District lies within 1.6km of Hamlet of Lowville Area in western part of District lies within 1.6km of Guelph Line/Derry Road Rural Cluster (E13)	Remaining areas lying more than 1.6km from designated boundaries
TRANSPORTATION FACTORS Traffic Service and Safety		Zone 22: -considerable off highway travel for Burlington and Oakville -Guelph Line is only N-S Regional Road; not considered suitable for major haulage route	Zone 9: -location of zone results in increasing haulage lengths not on highways	Zone 19: -maximum use of highways for haulage Zone 21: -some urban conflict potential in Milton

TABLE 41 con't...

DISTRICT D: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
SOCIAL FACTORS				
Population Density	(Area within and adjacent to Milton Urban Area excluded under Land Use Factors)			Less than 100 persons/square kilometre
Community Services and Institutions		Hospital is located in central part of District	North and east parts of District lie within Parkway Belt Cemetery is located adjacent to area in western part of District	
ECONOMIC FACTORS				
Land Costs (1982 $)	(Area within and adjacent to Milton Urban Area excluded under Land Use Factors)		$10,000-$50,000.00/ha (approx. $4,000 - $20,000/ac) in area lying within Burlington	Below $10,000.00/ha (approx. $4,000/ac) in area lying within Milton
Haul Costs (1982 $)				Zones 9, 19, 21
			Zone 21	
CULTURAL FACTORS				
Historical		(no known designated heritage features)		
Archaeological Resources		32 known sites; others in near vicinity		

TABLE 42

DISTRICT E: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Two small areas of Glacial Outwash Deposits (sand and gravel)		Remainder of District comprises Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability Classes 1, 2, 3, 4 apply to most of District	Small area of Agricultural Capability Classes 5, 6, 7 in northwest part of District	
Slope		Small area of +20% slope on western fringe of District	In remaining area, slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded		Areas over 100M from major watercourse	
Infiltration		One small area of infiltration in excess of 20cm per year in centre of District		Infiltration rate less than 15cm per year in remaining area
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	District lies adjacent to an area to be serviced during the next 20 years			

TABLE 42 con't...

DISTRICT E: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS				
Environmentally Sensitive Areas	Small area of wetland in southwestern part of District	Area adjacent to small area of wetland in southwestern part of District		
		Area in southwest central part of District lies adjacent to wetland		
	Wetland overlaps area in northeastern part of District	Area adjacent to wetland in northeastern part of District		
		Two "Significant Biological Areas" overlap parts of the central northeast area of the District	Areas adjacent to two "Significant Biological Areas" in central northeast area of the District	
LAND USE FACTORS				
Compatibility with Existing and Planned Land Use	The Mansewood Rural Cluster (E11) and adjacent area is excluded		Southwestern areas of District lie within 1.6km of Mansewood Rural Cluster (E11) and/or Milton Heights (Hamlet) and/or Milton planned Urban Area	Remaining areas lying more than 1.6km from designated boundaries
	The Whaley Corners Planned Rural Cluster (P3) and adjacent area is excluded		The southern extremity of the District lies within 1.6km of Whaley Corners Planned Rural Cluster (P3)	

TABLE 42 con't...

DISTRICT E: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
LAND USE FACTORS con't...			Areas in northern part of District lie within 1.6km of Ashgrove Rural Cluster (E7) and/or Georgetown Planned Urban Area Areas in central and southern parts of District lie within 1.6km of Agerton Planned Rural Cluster (P7) and/or Steel Avenue/Trafalgar Road Rural Cluster (E10) Area in south/southeast lies within 1.6km of Milton Urban Area	
TRANSPORTATION FACTORS Traffic Service and Safety		Zone 23: - considerable off-highway travel for Burlington and Oakville - Guelph Line is only N-S Regional Road not considered suitable for major haulage route	Zone 25: - not well serviced by highways Zone 26: - not well serviced by highways - future construction of Highways 407 and 403 will improve access considerably from the south Zone 28: - not well serviced by highways	Zone 19: - maximum use of highways for haulage Zone 21: - some urban conflict potential in Milton

TABLE 42 con't...

DISTRICT E: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
SOCIAL FACTORS				
Population Density				Less than 100 persons/square kilometre
Community Services and Institutions			Areas in south and east of District lie within Parkway Belt Two churches lie within District A cemetery is located in the northern part of the District One elementary school is located at the intersection of 5th Line and 5th sideroad	
ECONOMIC FACTORS				
Land Costs (1982 $)				Below $10,000.00/ha (approx. $4,000.00/ac)
Haul Costs (1982 $)			Zone 28 Zones 23, 25, 26	Zones 19, 21

TABLE 42con't...

DISTRICT E: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
CULTURAL FACTORS				
Historical		(no known designated heritage features)		
Archaeological Resources		Seven known sites: others in close proximity		

TABLE 43

DISTRICT F: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Two small areas of Glacial Outwash (sand and gravel) in central part of District		Remaining parts of District Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Most of District comprises Agricultural Capability Classes 1, 2, 3, 4	Two small areas of Agricultural Capability Classes 5, 6 7 in central and northeast parts of District	
Slope			Slopes of 0-20 %	
Distance from Major Watercourse	Areas within 100M setback were excluded	Not Applicable	Areas over 100M from Major Watercourse	
Infiltration		Two small areas of infiltration greater than 25cm per year in western part of District	Nil	Remaining area has infiltration rate of less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	Southern area in District lies adjacent to an area to be serviced in the next 20 years and close to an existing serviced area			

TABLE 43 con't...

DISTRICT F: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas	Southern part of District overlaps at two points with the Georgetown Credit River Valley (wetlands)	Areas lying adjacent to Credit River Valley in southern part of District		
LAND USE FACTORS Compatibility with Existing and Planned Land Use			Parts of the District lie within 1.6km of the Terracotta Proposed Rural Cluster (P7) or Glen Williams (Hamlet) and/or Georgetown Urban Area	
TRANSPORTATION FACTORS Traffic Service and Safety			Zone 27: -not well serviced by highways -future construction of Highways 407 and 403 will improve access considerably from the south Zone 30: -not well serviced by highways	
SOCIAL FACTORS Population Density Community Services and Institutions	No Impact	No Impact	No Impact	Less than 100 persons/square kilometre No Impact

TABLE 43 con't...

DISTRICT F: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
ECONOMIC FACTORS				
Land Costs (1982 $)			$10,000 - $50,000.00/ha (approx. $4,000-$20,000.00/ac)	
Haul Costs (1982 $)			Zones 27, 30	
CULTURAL FACTORS				
Historical		(no known designated features)		
Archaeological Resources		3 known sites, others in near vicinity		

TABLE 44

DISTRICT G: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Nil	Nil	Till & Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability Classes 1, 2, 3, 4	Nil	
Slope			Slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded		Areas over 100M from major watercourse	
Infiltration		Nil	Nil	Infiltration rate less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers	Areas of major overburden aquifer were excluded to avoid degradation of major supply aquifers from landfill contamination			
Water Serviced Areas	No planned or existing servicing available in close proximity to District			

TABLE 44 con't...

DISTRICT G: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas		District lies adjacent to Lake Medad Valley ESA7		No impact for areas not lying adjacent to Lake Medad
LAND USE FACTORS Compatibility with Existing and Planned Use	Part of the District overlaps with Britannia Road/Cedar Springs Road Planned Rural Cluster (P15) and is therefore excluded	Part of the District lies adjacent to Britannia Road/Cedar Springs Road Planned Rural Cluster	The District lies within 1.6km of the Britannia Rd./ Cedar Springs Road Planned Rural Cluster and/or the Hamlets of Alfred Harris Gardens and Kilbride	
TRANSPORTATION FACTORS Traffic Service and Safety			Zone 9: - location of zone results in increasing haulage length not on highways	
SOCIAL FACTORS Population Density				Less than 100 persons/square kilometre
Community Services and Institutions			Cemetery lies in central part of District	

TABLE 44 con't...

DISTRICT G: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
ECONOMIC FACTORS				
Land Costs (1982 $)			$10,000-$50,000.00/ha (approx. $4,000-$20,000.00/ac)	
Haul Costs (1982 $)				Zone 9
CULTURAL FACTORS				
Historical		(no known designated historical features)		
Archaeological Resources		(no known sites)		

TABLE 41

DISTRICT D: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capbility		Nil	Nil	Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability classes 1, 2, 3, 4	Nil	
Slope		Small area of +20% slope in Mansewood, which is excluded under "Land Use" factors	In remaining area, slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded	Not Applicable	More than 100M from major watercourse	
Infiltration		Nil	Nil	Infiltration rate less than 15cm per year
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifers were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	An area in the western part of the District is serviced, but is excluded under "Land Use" factors. Part of District lies adjacent to serviced areas.			

TABLE 41 con't...

DISTRICT D: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
BIOPHYSICAL FACTORS Environmentally Sensitive Areas	Area on the western fringe includes part of Crawford Lake - Rattlesnake Woods E.S.A.	Area near western fringe lies adjacent to Crawford Lake - Rattlesnake Woods E.S.A.	Area on southern fringe lies adjacent to "Spawning Nursery Area"	
LAND USE FACTORS Compatibility with Existing and Planned Land Use	Part of Milton built-up urban area and adjacent area excluded from northeast extremity of District	Northern extremity includes part of planned Milton Urban Area and lands adjacent	Northeastern areas of District lie within 1.6km of Milton Urban Area and/or Boyne Rural Cluster (P8) Southern part of District lies within 1.6km of Hamlet of Lowville Area in western part of District lies within 1.6km of Guelph Line/Derry Road Rural Cluster (E13)	Remaining areas lying more than 1.6km from designated boundaries
TRANSPORTATION FACTORS Traffic Service and Safety		Zone 22: -considerable off highway travel for Burlington and Oakville -Guelph Line is only N-S Regional Road; not considered suitable for major haulage route	Zone 9: -location of zone results in increasing haulage lengths not on highways	Zone 19: -maximum use of highways for haulage Zone 21: -some urban conflict potential in Milton

TABLE 41 con't...

DISTRICT D: ENVIRONMENTAL IMPACTS con't...

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
SOCIAL FACTORS				
Population Density	(Area within and adjacent to Milton Urban Area excluded under Land Use Factors)			Less than 100 persons/square kilometre
Community Services and Institutions		Hospital is located in central part of District	North and east parts of District lie within Parkway Belt Cemetery is located adjacent to area in western part of District	
ECONOMIC FACTORS				
Land Costs (1982 $)	(Area within and adjacent to Milton Urban Area excluded under Land Use Factors)		$10,000-$50,000.00/ha (approx. $4,000 - $20,000/ac) in area lying within Burlington	Below $10,000.00/ha (approx. $4,000/ac) in area lying within Milton
Haul Costs (1982 $)				Zones 9, 19, 21
CULTURAL FACTORS			Zone 21	
Historical		(no known designated heritage features)		
Archaeological Resources		32 known sites; others in near vicinity		

TABLE 42

DISTRICT E: ENVIRONMENTAL IMPACTS

FACTORS	LEVELS OF IMPACT			
	Unacceptable	High	Moderate	Low
PHYSICAL FACTORS				
Attenuation Capability		Two small areas of Glacial Outwash Deposits (sand and gravel)		Remainder of District comprises Till and Clay Plains
Overburden Thickness		Nil	Nil	Predominantly greater than 15M
Agricultural Capability		Agricultural Capability Classes 1, 2, 3, 4 apply to most of District	Small area of Agricultural Capability Classes 5, 6, 7 in northwest part of District	
Slope		Small area of +20% slope on western fringe of District	In remaining area, slopes of 0-20%	
Distance from Major Watercourse	Areas within 100M setback were excluded		Areas over 100M from major watercourse	
Infiltration		One small area of infiltration in excess of 20cm per year in centre of District		Infiltration rate less than 15cm per year in remaining area
Buried Valley - Aquifer Complexes	Areas with possible buried valley aquifer complexes were excluded			
Type and Distribution of Aquifers (Major Overburden and Bedrock Aquifers)	Areas of major overburden and bedrock aquifer were excluded to avoid degradation of major supply aquifers from landfill contaminants			
Water Serviced Areas	District lies adjacent to an area to be serviced during the next 20 years			

APPENDIX 1

ENVIRONMENTAL ASSESSMENT OF THE LANDFILL COMPONENT OF HALTON'S SOLID WASTE MANAGEMENT SYSTEM

REPORT ON THE INFORMATION CENTRE: PHASE TWO, STAGE TWO: GENERAL OVERVIEW ANALYSIS

Prepared by

INSTITUTE OF ENVIRONMENTAL RESEARCH INC.
5441 Yonge Street, Suite 201
Willowdale, Ontario M2N 5S1

August, 1983

ENVIRONMENTAL ASSESSMENT OF THE LANDFILL COMPONENT OF HALTON'S SOLID WASTE MANAGEMENT PROGRAM

REPORT ON PHASE TWO, STAGE TWO INFORMATION CENTRE

1. Introduction

An Information Centre was held on July 20, 1983 at the Halton Regional Administration Building to review the Draft Evaluation Factors for the General Overview Analysis. Information was available for public review and comment on the screening process that was proposed to identify potential areas within the Halton Region for landfilling and the proposed evaluation factors to be used in this screening process.

Members of the study team were available at the Information Centre to meet with the public between 5 p.m. and 10 p.m. The Information Centre was advertised in local newspapers and letters of invitation were sent to the study's mailing list. Individuals attending the Information Centre were provided with background information summarizing the study team's approach to the General Overview Analysis stage of the site selection process. (This material is reproduced in Appendix One.) Copies of the study team's report entitled Draft Evaluation Factors: Phase 2 Stage 2A, General Overview Analysis were also available. Anyone interested in receiving further information on the study or having comments on the material presented at the Information Centre were asked to return a Comment Sheet. (Appendix Two) The public were invited to comment generally on the proposed evaluation factors and screening process. The Comment Sheets also addressed specific questions designed to solicit public input on the evaluation factors used at this stage of the study and the priorities assigned to these factors.

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Ten individuals excluding representatives of the Regional Municipality of Halton signed the registration book indicating their attendance at the Information Centre. A comment Sheet was returned by one individual, one individual asked to be added to the study's mailing list.

2. Summary of Public Input

The input from the single Comment Sheet returned at the Information Centre can be summarized as follows:

- the Overview Analysis procedure appears well founded and thorough
- the order of priorities as outlined in Panel 6 is acceptable
- every consideration should be given to reducing the landfill component to a minimum by resource recovery and energy extration.

3. Request for Further Involvement

The following individual asked to be added to the study's mailing list.

Mr. R.J. Fahey
827 Shadeland Avenue
Burlington, Ontario
L7T 2M2

APPENDIX : HAUL COST ANALYSIS BY ZONE IN HALTON REGION
(1982 dollars)

1986 Haul Cost to Zone 3

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	5	25	2.25	2.75		
Oakville	11	37	3.33	4.07		
Milton	32	79	7.11	8.69		
Hal Hills Col	8	24	2.16	2.64		
Trans	47	109			10.95	15.36
TOTAL REGION ($/tonne)			4.05	5.14		

1986 Haul Cost to Zone 6

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	9	33	2.97	3.63		
Oakville	22	59	5.31	6.49		
Milton	43	101	9.09	11.11		
Hal Hills Col	8	24	2.16	2.64		
Trans	58	131			12.27	16.68
TOTAL REGION ($/tonne)			5.43	6.79		

1986 Haul Cost to Zone 7

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	11	37	3.33	4.07		
Oakville	23	61	5.49	6.71		
Milton	36	87	7.83	9.57		
Hal Hills Col	8	24	2.16	2.64		
Trans	52	119			11.55	15.96
TOTAL REGION ($/tonne)			5.50	6.90		

1986 Haul Cost to Zone 8

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	11	37	3.33	4.07		
Oakville	19	53	4.77	5.83		
Milton	32	79	7.11	8.69		
Hal Hills Col	8	24	2.16	2.64		
Trans	50	115			11.31	15.72
TOTAL REGION ($/tonne)			5.13	6.45		

1986 Haul Cost to Zone 9

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	15	45	4.05	4.95		
Oakville	27	69	6.21	7.59		
Milton	28	71	6.39	7.81		
Hal Hills Col	8	24	2.16	2.64		
Trans	42	99			10.35	14.76
TOTAL REGION ($/tonne)			5.89	7.39		

1986 Haul Cost to Zone 16

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)	6Ct+Trans. St. ($/tonne)	
Burlington	12	39	3.51	4.29		
Oakville	11	37	3.33	4.07		
Milton	24	63	5.67	6.93		
Hal Hills Col	8	24	2.16	2.64		
Trans	37	89			9.75	14.16
TOTAL REGION ($/tonne)			4.38	5.56		

	A	B	C	D	E	F	G
			1986 Haul Cost to Zone 18				
125							
126	Municipality	One Way	Return Trip		Cost Per Tonne		
127		Travel Time	Incl Disposal	9 Ct	11 Ct	6 Ct+Trans.	St.
128							
129		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
130							
131	Burlington	19	53	4.77	5.83		
	Oakville	10	35	3.15	3.85		
133	Milton	21	57	5.13	6.27		
134	Hal Hills Col	8	24	2.16	2.64		
135	Trans	30	75			8.91	13.32
136							
137			TOTAL REGION	4.73	6.01		
138			($/tonne)				
139							
140							
141							
142			1986 Haul Cost to Zone 19				
143							
145	Municipality	One Way	Return Trip		Cost Per Tonne		
146		Travel Time	Incl Disposal	9 Ct	11 Ct		
147							
		(min.)	(min.)	($/tonne)	($/tonne)		
149							
150	Burlington	18	51	4.59	5.61		
151	Oakville	18	51	4.59	5.61		
152	Milton	16	47	4.23	5.17		
	Halton Hills	30	75	6.75	8.25		
154							
155							
156			TOTAL REGION	4.77	5.83		
157			($/tonne)				
158							
159							
160							
161			1986 Haul Cost to Zone 20				
162							
163							
165	Municipality	One Way	Return Trip		Cost Per Tonne		
166		Travel Time	Incl Disposal	9 Ct	11 Ct		
167							
		(min.)	(min.)	($/tonne)	($/tonne)		
168							
169	Burlington	28	71	6.39	7.81		
170	Oakville	19	53	4.77	5.83		
171	Milton	26	67	6.03	7.37		
172	Halton Hills	22	59	5.31	6.49		
174							
175			TOTAL REGION	5.61	6.85		
176			($/tonne)				

	A	B	C	D	E	F	G
183			1986 Haul Cost to Zone 21				
184							
186	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	11 Ct		
188		(min.)	(min.)	($/tonne)	($/tonne)		
189							
191	Burlington	29	73	6.57	8.03		
192	Oakville	28	71	6.39	7.81		
193	Milton	5	25	2.25	2.75		
	Halton Hills	23	61	5.49	6.71		
195							
196							
197			TOTAL REGION	6.09	7.44		
198			($/tonne)				
199							
200							
201							
202			1986 Haul Cost to Zone 22				
203							
204							
205	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6 Ct+Trans.	St.
207		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
208							
209							
	Burlington	24	63	5.67	6.93		
211	Oakville	35	85	7.65	9.35		
212	Milton	17	49	4.41	5.39		
213	Hal Hills Col	8	24	2.16	2.64		
	Trans	33	81			9.27	13.68
215							
216			TOTAL REGION	6.92	8.68		
217			($/tonne)				
218							
219							
220							
221			1986 Haul Cost to Zone 23				
222							
223							
224	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	11 Ct		
225		(min.)	(min.)	($/tonne)	($/tonne)		
228							
229	Burlington	32	79	7.11	8.69		
230	Oakville	44	103	9.27	11.33		
231	Milton	10	35	3.15	3.85		
232	Halton Hills	25	65	5.85	7.15		
233							
234							
			TOTAL REGION	7.59	9.27		
236			($/tonne)				

A	B	C	D	E

1996 Haul Cost to Zone 24

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	38	91	9.19	10.01
Oakville	50	115	10.35	12.65
Milton	16	47	4.23	5.17
Halton Hills	23	61	5.49	6.71
TOTAL REGION ($/tonne)			8.53	10.43

1996 Haul Cost to Zone 25

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	34	83	7.47	9.13
Oakville	39	93	8.37	10.23
Milton	7	29	2.81	3.19
Halton Hills	13	41	3.69	4.51
TOTAL REGION ($/tonne)			7.13	8.72

1996 Haul Cost to Zone 26

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	41	97	8.73	10.67
Oakville	34	83	7.47	9.13
Milton	13	45	4.05	4.95
Halton Hills	14	43	3.87	4.73
TOTAL REGION ($/tonne)			7.43	9.08

A	B	C	D	E

1986 Haul Cost to Zone 27

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	53	121	10.89	13.31
Oakville	45	105	9.45	11.55
Milton	23	61	5.49	6.71
Halton Hills	8	31	2.79	3.41
TOTAL REGION ($/tonne)			9.16	11.20

1986 Haul Cost to Zone 28

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	43	101	8.09	11.11
Oakville	47	109	9.81	11.99
Milton	11	37	3.73	5.07
Halton Hills	10	35	3.45	3.33
TOTAL REGION			8.41	10.28

A	B	C	D	E

1986 Haul Cost to Zone 29

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	47	109	9.81	11.99
Oakville	54	123	11.07	13.53
Milton	16	47	4.23	5.17
Halton Hills	13	41	3.69	4.51
TOTAL REGION ($/tonne)			9.35	11.43

	A	B	C	D	E
			1986 Haul Cost to Zone 30		
181					
182					
183	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	Cost Per Tonne 11 Ct
184					
185					
186		(min.)	(min.)	($/tonne)	($/tonne)
187					
	Burlington	55	125	11.25	13.75
	Oakville	50	115	10.35	12.65
190	Milton	25	65	5.85	7.15
191	Halton Hills	9	33	2.97	3.63
192					
193					
194			TOTAL REGION ($/tonne)	9.72	11.88
195					
196					
197					
198					
199					
202					
203			C.N. WATSON AND ASSOCIATES LTD.		

	A	B	C	D	E	F	G
3							
4			2001 Haul Cost to Zone 3				
5							
6							
7	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
8		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
9							
12	Burlington	5	25	2.25	2.75		
13	Oakville	11	37	3.33	4.07		
14	Milton	33	81	7.29	8.91		
15	Hal Hills Col	8	24	2.16	2.64	10.23	14.64
16	Trans	41	97				
17							
18			TOTAL REGION ($/tonne)	4.08	5.20		
19							
20							
21			2001 Haul Cost to Zone 6				
24							
25	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
28		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
29							
30	Burlington	9	33	2.97	3.63		
31	Oakville	22	59	5.31	6.49		
32	Milton	43	101	9.09	11.11		
33	Hal Hills Col	8	24	2.16	2.64	11.55	15.96
34	Trans	52	119				
35							
36			TOTAL REGION ($/tonne)	5.48	6.89		
37							
38							
39			2001 Haul Cost to Zone 7				
40							
41							
44	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
45		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
46							
47		11	37	3.33	4.07		
48	Burlington	23	61	5.49	6.71		
49	Oakville	32	79	7.11	8.69		
50	Milton	8	24	2.16	2.64		
	Hal Hills Col	41	97			10.23	14.64
	Trans						
53			TOTAL REGION ($/tonne)	5.44	6.87		
54							
55							

	A	B	C	D	E	F	G
63			2001 Haul Cost to Zone 8				
66	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
69		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
71	Burlington	11	37	3.33	4.07		
72	Oakville	19	53	4.77	5.83		
	Milton	28	71	6.39	7.81		
	Hal Hills Col	8	24	2.16	2.64		
75	Trans	39	93			9.99	14.40
77		TOTAL REGION ($/tonne)		5.06	6.40		
82		2001 Haul Cost to Zone 9					
87	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
88		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
91	Burlington	15	45	4.05	4.95		
92	Oakville	27	69	6.21	7.59		
	Milton	28	71	6.39	7.81		
	Hal Hills Col	8	24	2.16	2.64		
95	Trans	42	99			10.35	14.76
97		TOTAL REGION ($/tonne)		6.01	7.56		
101		2001 Haul Cost to Zone 16					
104	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6Ct+Trans. St.	
107		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
109	Burlington	12	39	3.51	4.29		
110	Oakville	11	37	3.33	4.07		
111	Milton	24	63	5.67	6.93		
112	Hal Hills Col	8	24	2.16	2.64		
113	Trans	37	89			9.75	14.16
116		TOTAL REGION ($/tonne)		4.43	5.64		

2001 Haul Cost to Zone 18

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)	6 Ct+Trans. St ($/tonne)	
Burlington	19	53	4.77	5.83		
Oakville	10	35	3.15	3.85		
Milton	21	57	5.13	6.27		
Hal Hills Col	8	24	2.16	2.64		
Trans	28	71			8.67	13.08
TOTAL REGION ($/tonne)			4.70	6.00		

2001 Haul Cost to Zone 19

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	17	49	4.41	5.39
Oakville	18	51	4.59	5.61
Milton	16	47	4.23	5.17
Halton Hills	30	75	6.75	8.25
TOTAL REGION ($/tonne)			4.72	5.76

2001 Haul Cost to Zone 20

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	Cost Per Tonne 11 Ct ($/tonne)
Burlington	23	61	5.49	6.71
Oakville	18	51	4.59	5.61
Milton	26	67	6.03	7.37
Halton Hills	22	59	5.31	6.49
TOTAL REGION ($/tonne)			5.11	6.25

	A	B	C	D	E	F	G
183			2001 Cost to Zone 21				
184							
185							
186	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	11 Ct		
187							
188							
189		(min.)	(min.)	($/tonne)	($/tonne)		
191	Burlington	28	71	6.39	7.81		
192	Oakville	28	71	6.39	7.81		
193	Milton	5	25	2.25	2.75		
194	Halton Hills	23	61	5.49	6.71		
195							
196							
197			TOTAL REGION	6.03	7.37		
198			($/tonne)				
199							
200							
201							
202			2001 Haul Cost Zone 22				
203							
204							
205	Municipality	One Way Travel Time	Return Trip Incl Disposal	9 Ct	Cost Per Tonne 11 Ct	6 Ct+ Trans.	St
207							
208		(min.)	(min.)	($/tonne)	($/tonne)	($/tonne)	
209							
210	Burlington	24	63	5.67	6.93		
211	Oakville	35	85	7.65	9.35		
212	Milton	17	49	4.41	5.39		
213	Hal Hills Col	8	24	2.16	2.64		
214	Trans	33	81			9.27	13.68
215							
216			TOTAL REGION	7.04	8.85		
217			($/tonne)				
218							
219							
220							
221			2001 Haul Cost to Zone 23				
222							
223							
224	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	11 Ct		
225							
226							
227		(min.)	(min.)	($/tonne)	($/tonne)		
228							
229	Burlington	32	79	7.11	8.69		
230	Oakville	44	103	9.27	11.33		
231	Milton	10	35	3.15	3.85		
232	Halton Hills	25	65	5.85	7.15		
233							
234							
235			TOTAL REGION	7.67	9.38		
236			($/tonne)				

A	B	C	D	E

2001 Haul Cost to Zone 24

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
Burlington	38	91	8.19	10.01
Oakville	50	115	10.35	12.65
Milton	16	47	4.23	5.17
Halton Hills	23	61	5.49	6.71
TOTAL REGION ($/tonne)			8.61	10.52

2001 Haul Cost to Zone 25

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
Burlington	33	81	7.29	8.91
Oakville	39	93	8.37	10.23
Milton	7	29	2.61	3.19
Halton Hills	13	41	3.69	4.51
TOTAL REGION ($/tonne)			7.10	8.67

2001 Haul Cost to Zone 26

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
Burlington	32	79	7.11	8.69
Oakville	23	61	5.49	6.71
Milton	15	45	4.05	4.95
Halton Hills	14	43	3.87	4.73
TOTAL REGION ($/tonne)			5.87	7.18

A	B	C	D	E

2001 Haul Cost to Zone 27

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
Burlington	43	101	9.09	11.11
Oakville	34	83	7.47	9.13
Milton	23	61	5.49	6.71
Halton Hills	8	31	2.79	3.41
TOTAL REGION ($/tonne)			7.51	9.18

2001 Haul Cost to Zone 28

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
[illegible]ington	42	99	8.91	10.89
[illegible]ville	46	107	9.63	11.77
[illegible]ton	11	37	3.33	4.07
[illegible]ton Hills	10	35	3.15	3.85
TOTAL REGION			9.28	10.12

A	B	C	D	E

2001 Haul Cost to Zone 29

Municipality	One Way Travel Time (min.)	Return Trip Incl Disposal (min.)	Cost Per Tonne 9 Ct ($/tonne)	11 Ct ($/tonne)
Burlington	47	109	9.81	11.99
Oakville	54	123	11.07	13.53
Milton	16	47	4.23	5.17
Halton Hills	13	41	3.69	4.51
TOTAL REGION ($/tonne)			9.38	11.47

	A	B	C	D	E
			2001 Haul Cost to Zone 30		
185					
186					
187	Municipality	One Way Travel Time	Return Trip Incl Disposal	Cost Per Tonne 9 Ct	11 Ct
188					
189					
190		(min.)	(min.)	($/tonne)	($/tonne)
191					
	Burlington	54	123	11.07	13.53
193	Oakville	50	115	10.35	12.65
194	Milton	25	65	5.85	7.15
195	Halton Hills	9	33	2.97	3.63
196					
197					
198			TOTAL REGION	9.59	11.73
199			($/tonne)		
200					
201					
202					
203					
205					
206					
207					
			C.N. WATSON AND ASSOCIATES LTD.		

POOR

QUALITY

ORIGINAL